Telephony

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Fundamentals of Inductive Interference

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FIRST OF SERIES of three articles presenting basic principles of inductive interference on telephone lines due to paralleling power lines. Part I analyzes the separate components of inductive interference and determining factors. How noise is induced into grounded telephone circuits and into metallic telephone circuits. Unbalances and transpositions

THE RAPID growth of rural power lines, plans for extending these systems, and especially rumors of certain types of unusual construction to lower initial power line costs have focused the attention of telephone people on the problem of inductive interference. This series of articles will discuss the methods by which noise-producing voltages are induced into telephone circuits, thereby causing inductive interference.

Two types of interference are of greatest importance to telephone people. These are: First, the introduction of noise from power lines into paralleling telephone lines; and second, crosstalk between paralleling telephone circuits. These articles will be devoted to noise induction from power systems.

A power line operates at a high level, transmitting large amounts of electrical energy. On the other hand, the speech currents and voltages on telephone lines are very low, and during a conversation the electrical energy transmitted is small. It is not surprising, therefore, that great care must be exercised to prevent the transfer of electrical energy from a power line to a paralleling telephone circuit.

This transfer of energy may occur in any one, or in all three, of the following ways: *First*, through leaks or other conducting paths; *second*, through magnetic fields produced by currents in the power system; and *third*, through dielectric (or electric) fields produced by power-line voltages. The first cause of interference is usually not bothersome and its remedy is obvious.

Inductive interference is of two general types: first, a 60-cycle or *low-frequency* induction,[1] and second, a *high-frequency* or noise induction.[2] These articles will deal largely with noise induction, since low-frequency induction is usually only bothersome during times of faults, such as grounds, on power systems.

Those desiring information on low-frequency induction should consult the article by Messrs. Conwell and Warren (reference 1) and a more recent article[3] by Messrs. Huntley and O'Connell. Very briefly, this interference is the induction of large 60-cycle voltages and resultant currents into telephone circuits. The magnitudes of these may be sufficient to interrupt telephone service by operating protection or by damaging apparatus; they often constitute a physical hazard to telephone employes; and sometimes produce serious acoustic shocks.

Fundamentals Easily Understood

Although inductive interference is complex in nature, the fundamentals are easily understood, *if the subject is analyzed* into the separate components. The tendency is, however, to look at the problem as a formidable whole, rather than to attack its vulnerable parts.

In studying the subject, comparisons are often misleading. To *assume* that interference exists on a particular telephone system for the same reasons that it occurred on another circuit is hazardous. It is usually necessary to analyze care-

1. "Status of Joint Development and Research on Low-Frequency Induction," by R. N. Conwell and H. S. Warren. Bell System Technical Journal, Vol. X, No. 2, April, 1931. See also Proceedings of the American Institute of Electrical Engineers, 1931.
2. "Status of Joint Development and Research on Noise Frequency Induction," by H. L. Wills and O. B. Blackwell. Same sources as reference 1.
3. "Some Aspects of Low-Frequency Induction Between Power and Telephone Circuits," by R. H. Huntley and E. J. O'Connell. Bell System Technical Journal, Vol. XIV, No. 4, October, 1935.

fully *each* case of interference and to *actually determine* the causes before a remedy can be found.

Inductive interference and methods of reducing it have been studied extensively by cooperative engineering groups from the telephone and power operating companies. The principles are now well understood. (For further information on this subject, consult the bibliographies following references 1 and 2). If excessive interference is experienced, it is usually safe to say that the construction, maintenance, or operation of either the power or telephone systems are not in accordance with recommended practices.

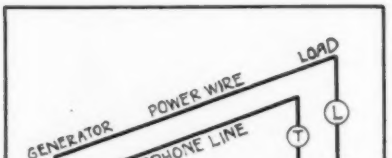

FIG. A.

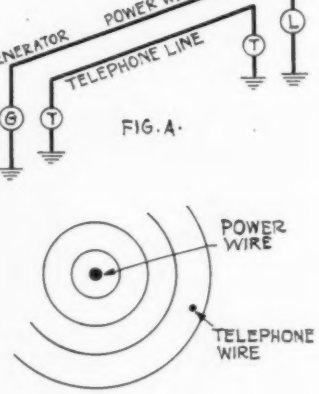

FIG. B.

Fig. 1. The Varying Magnetic Lines of Force Produced by the Alternating Current in the Power Wire Induce a Voltage in a Paralleling Telephone Circuit.

Noise Is Induced Through Magnetic and Dielectric Fields

The electrical energy causing noise is transferred from a power line to a paralleling telephone line through the magnetic and dielectric (or electric) fields existing about the power circuits.

The magnetic fields are caused by the *currents* in the power wires and magnetic lines of force *encircle* the wires carrying these currents. Dielectric fields are produced by the *voltages* on power lines; and dielectric lines of force exist *between* the wires of a power transmission line and also between these wires and ground.

Thus, magnetic fields are produced by currents and dielectric fields by voltages. These fields exist together when a circuit transmits power.

A power transmission circuit carries *alternating* currents, and these cause a *rapidly-changing* magnetic field. If the lines of force constituting this magnetic field cut across the wires of a paralleling telephone line, an alternating voltage will be induced in the telephone wires, and if conditions permit, interfering noise currents will flow.

Similarly, an *alternating* voltage exists between the power-line conductors, and hence a *rapidly-changing* dielectric field exists about the power line. If a telephone circuit is in the vicinity of the power line, it will be influenced by this dielectric field. This will cause the potentials of the telephone wires to rapidly change, and this may cause noise currents to flow through the connected telephone sets.

Thus, noise currents may be induced in telephone circuits by either power-line currents, by voltages, or by both. The basic or 60-cycle fundamental seldom causes troublesome noise interference. Commercial power system voltages and currents are not pure 60-cycle impulses, however, and it is the harmonics or multiples of this 60-cycle fundamental frequency which cause the trouble.

A high-grade commercial telephone circuit transmits frequencies from about 250 to 2,750 cycles per second; the telephone receiver is most efficient at from 800 to 1,000 cycles; and the human ear is very sensitive to these frequencies. Thus, for comparable magnitudes, the harmonics—say, from the ninth (540 cycles) to the 21st (1,260 cycles)—have a greater noise-producing tendency than the other components of the power wave.

Factors Determining Interference

As is well known, in many instances power lines and telephone lines exist parallel to each other at roadside separation for great distances, and with little interference being experienced. On the other hand, certain short parallels may be very noisy. Why is this true? The three important factors[2] which determine the interference experienced are as follows:

1. Influence factors.
2. Susceptiveness factors.
3. Coupling factors.

Each power circuit has certain distinguishing characteristics of its line and associated apparatus—such as generators, transformers, and loads—which determine the nature and intensity of the electric and magnetic fields produced. Thus, each power line has a certain *tendency* to produce noise, or a given *influence factor*.

Each telephone circuit also has its special features, including those of its line and connected apparatus. These determine its *responsiveness* to the fields produced by a power circuit, and hence its *susceptiveness factor*.

Also, each parallel has certain individual characteristics such as length and separation. These determine the actual induction which will occur for given conditions, and hence determine the *coupling factor*.

Thus, in attacking any interference condition, these three factors must be studied. How is the power line constructed and operated? Is the telephone line so arranged that it is especially susceptible to noise? Is the length of parallel and the separation favorable to induction?

Theoretically, power lines can be so constructed and operated that they will not influence neighboring communication circuits; similarly, it is theoretically possible to build telephone lines which will not pick up noise. Lastly, *all* parallels can be made as short and the separation as large as possible. But the attainment of these ideals is impracticable, and they can only be approached as near as economy will permit.

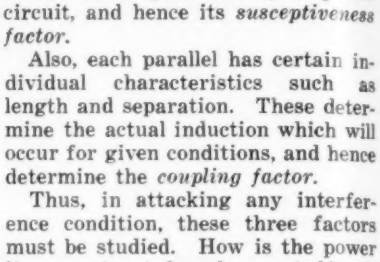

Fig. 2. The Varying Magnetic Lines of Force Produced by the Alternating Current in the Power Wire Induce Voltages e_1 and e_2 in the Telephone Conductors. These Voltages Are Represented by Small Generators Connected in the Telephone Line Wires.

How Induction Occurs

Before proceeding further, it is advisable to consider *one* type of induction, realizing that noise may be produced in other ways. In Fig. 1-A the power circuit—consisting of one overhead wire and a ground return—paralleled by a grounded telephone line, will be considered.

Except for railway trolley circuits, power lines are never operated in this manner, but, as will be shown in the second article of this series, under certain conditions they act as if they were. This illustration also holds for crosstalk between two grounded telephone lines, such as are sometimes used in rural districts.

As previously explained, the rapidly-changing alternating current in the power circuit will produce a varying magnetic field around the power wire of Fig. 1. This field will link with the telephone circuit as shown in Fig. 1-B, and, as the alternating current changes, this varying field will cut across the telephone wire and *will induce a voltage in the wire* according to the laws of electromagnetic induction (TELEPHONY, February 16, 1935, page 13). Noise currents, therefore, will flow around the loop completed by the telephone sets and the ground return.

The induction just considered was from the power-circuit current; the effect of the power-circuit voltage will now be considered. This voltage is impressed by the generator between the power line wire and ground, and this alternating voltage establishes a rapidly-varying dielectric field (largely) between this wire and ground. But, the paralleling telephone wire is (substantially) at ground potential, and thus, *some* of the dielectric lines of force from the power line will terminate on the telephone wire.

Dielectric lines of force are considered to extend from positive to negative charges (TELEPHONY, March 2, 1935, page 9). Thus, if the power wire is positive with respect to ground at a given instant, negative charges will exist on the ground and on the telephone line. During the next part of the alternating current cycle, however, the power wire will be negative, and the earth and the telephone wire must be positive with respect to it.

As the polarity and hence the charges on the power wire vary in accordance with the alternating voltage impressed by the generator, it is apparent that the electrical charges on the telephone line are also caused to vary. For these to vary, charges constituting a noise current must flow through the grounded telephone sets. The harmonics of the power system are then plainly audible in the telephone receivers.

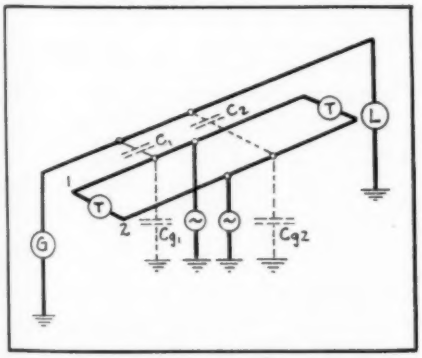

Fig. 3. The Distributed Capacitances Between a Power Wire and a Metallic Telephone Line and Between the Telephone Line and Ground Are Shown by Dotted Condensers. The Small Generators Represent the Induced Voltage to Ground.

In the preceding illustrations both inductive coupling and capacitive coupling exist, and the electrical energy producing the noise currents is transferred through both the magnetic and the dielectric fields.

Noise in Metallic Circuits

The preceding discussion considered noise induced into a *grounded* telephone circuit; in this section induction into a *metallic* or two-wire telephone lines will be discussed. A grounded power line will be used again for simplicity.

The circuits are shown in Fig. 2. The alternating current in the power wire creates a varying magnetic field which induces voltages e_1 and e_2 in the telephone wires. If the direction of the power current is as shown at a given instant, the induced voltages in the telephone wires will be as indicated, both voltages acting in the same direction.

Wire No. 1 is closer to the power wire than wire No. 2; therefore, e_1 will be greater than e_2. Since this is true, a resultant voltage exists, and a noise current will be forced around the circuit and through the telephone sets as indicated.

Inducing voltages in each telephone line wire as just explained produces a voltage which also acts through a ground path. Suppose that in Fig. 2 a high impedance a-c voltmeter is connected between the left end of wire No. 2 and ground. This voltmeter is actually connected to one terminal of the imaginary generator representing the voltage induced in wire No. 2. The other end of this generator is connected to ground through the distributed capacitance between wire No. 2 and ground. The voltmeter needle will deflect, proving that a difference of potential exists which will cause current flow through a grounded circuit.

The preceding explanations were for induction from power *currents;* induction into a *metallic* telephone circuit from the *voltage* on a grounded power line will now be considered. The alternating voltage impressed on the power wire by the grounded power generator produces a rapidly-varying dielectric field between the power wire and ground. This field will extend into the space occupied by the telephone wires.

Under the section heading *"How Induction Occurs,"* the noise induced in a *grounded* telephone line by a grounded power line was explained on the basis of dielectric lines and electric charges. This was done to present the basic principles as clearly as possible. These are in reality capacitive effects acting through the distributed capacitances between the wires. Power line voltages act through these capacitances and noise-producing voltages are caused in telephone circuits.

In order to make this clear, suppose that a 1.0 microfarad and a 2.0

TIMELY SERIES ON INDUCTIVE INTERFERENCE

THE PROSPECTIVE extensions of electric power lines in the rural districts, due to the efforts of the Rural Electrification Administration, has drawn great attention among telephone men to the problem of inductive interference.

Sensing the need for authoritative information concerning inductive interference from power lines, resulting in the production of noise on the telephone lines, TELEPHONY is presenting a series of three articles on the subject, prepared by Professor Arthur L. Albert, Associate Professor of Communication Engineering, Oregon State College.

Professor Albert has written a number of articles for TELEPHONY and those who read his series on "Fundamental Principles of Electricity" for the telephone worker, published last year in TELEPHONY, will welcome his new series on this important topic.

In preparing these articles, Professor Albert has carefully avoided the use of unfamiliar electrical terms wherever possible. He has kept constantly in mind the needs of TELEPHONY's readers, and has so presented the basic principles of the subject that those in the telephone industry should be greatly benefited by them.

microfarad condenser are connected in series across 120 volts, 60 cycles. Since they are in series, the current through each must be the same. The voltage across each will be different, however, 80 volts being across the 1.0 mf. condenser, and 40 volts across the 2.0 mf. one (TELEPHONY, May 4, 1935, page 21).

Now suppose this reasoning is applied to Fig. 3. The dotted lines and condensers C_1, C_2, C_{g1}, and C_{g2} represent the distributed capacitances between the wires, and between the telephone wires and ground. Since there is a voltage between the power wire and ground, this voltage also acts across the series capacitive circuits C_1-C_{g1} and C_2-C_{g2} as explained in the preceding paragraph.

Wires closer together have greater capacitance than those farther apart; hence, C_1 will be greater than C_2. The telephone wires are symmetrical with respect to ground, however, and C_{g1} will equal C_{g2}. Again following the theory previously discussed, the charging current through C_1-C_{g1} will be different from that through C_2-C_{g2}, because wire No. 1 is closer to the power line and C_1 is greater than C_2. The voltages appearing across each distributed capacitance, therefore, will be different.

A voltage will exist between each telephone wire *and ground*, and these voltages will be slightly different. Thus, each telephone wire is raised to a voltage *above ground*, and (since they are slightly different) a difference of potential or a *voltage also exists between line wires*. The voltages to ground are represented in Fig. 3 by small generators connected between the telephone wires and ground.

It should be remembered that the explanations thus far given do not cover all the ways in which voltages are induced in telephone circuits. They are given in detail to show the basic principles, and that *two* types

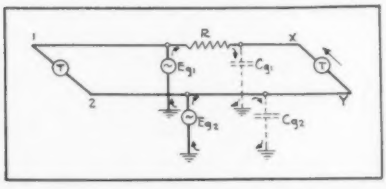

Fig. 4. Voltages to Ground Act Through the Series Resistance Unbalance R to Produce Noise.

of voltages are induced on telephone lines; first, voltages acting in series or *along* the wires, and second, voltages acting *between the wires and ground*.

It has been shown how voltages between telephone wires cause noise currents to flow around through the receivers of the telephone sets terminating the ends of the line. It is not so obvious how voltages between the *wires and ground* cause noise. These voltages to ground act through line unbalances as will now be explained.

Telephone Line Unbalances

Unbalances in telephone lines are of two types: first, *series unbalances;* and second, *unbalances to ground*. Series unbalances are usually due to improperly made or to corroded splices in the line wires. Unbalances to ground are usually due to tree or bush "leaks," to broken insulators, and to other causes of low insulation.

The effect of a series unbalance due to a poor splice is shown in Fig. 4. The induced voltages to ground are represented by E_{g1} and E_{g2}, and the capacitances to ground by C_{g1} and C_{g2}. It is apparent that each of these imaginary generators will tend to send a current to ground (as shown by the arrows) through the distributed capacitances.

There will be a voltage drop in the series unbalance represented by the resistor, however, and thus the potential at point X will be lower than at point Y. Noise current will, accordingly, flow through the telephone set as indicated.

An unbalance to ground, such as a bad tree "leak," acts as follows: It tends to lower the potential of the wire on which it occurs, to ground potential. Since the other wire of the telephone pair is at a higher potential, noise currents will flow through the telephone sets.

A voltage to ground, therefore, acts as a possible source of noise, even if it is not actually causing it. If noise is to be kept down, the telephone lines must be constructed and maintained better than would be necessary if the voltage to ground did not exist.

If a metallic telephone line is noisy, the insulation resistance should be checked; and if it is low, it should be improved by cutting out tree and bush "leaks," and by replacing defective insulators; also, dirty protector blocks should be cleaned. If the series resistance of each line wire is not the same, faulty splices should be removed.

Telephone Line Transpositions

Telephone line transpositions are often (but not always) effective in reducing noise. Suppose that the circuit of Fig. 2 is transposed at its center, giving the conditions of Fig. 5. Now the total voltage induced in wire No. 1 by the power current is $e_1+e'_1$ and that induced in wire No. 2 is $e_2+e'_2$. Furthermore, since the positions of the telephone wires have been interchanged, these two sums are equal and opposite and *no* resultant voltage exists to force a current through the connected telephone sets.

Transpositions in the telephone line wires so interchange their posi-

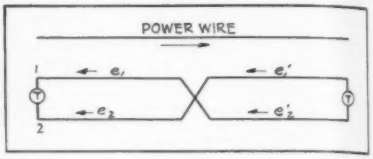

Fig. 5. Transpositions in the Telephone Line Wires Tend to Equalize the Voltages Induced in Each Line Wire, Thus Largely Preventing These Voltages From Causing Noise Currents.

tions that the voltage to which each wire is raised above ground is the same. This follows from a study of Fig. 3. Note that transpositions *do not prevent* the wires from being raised to a voltage above ground; it merely equalizes them, and in so doing reduces the noise. These voltages may still act through unbalances to ground (caused by poor insulation) and series unbalances in the line wires and cause excessive noise.

Summary

The harmonics in power transmission lines may cause the flow of similar harmonic currents in paralleling telephone circuits, thus producing interfering noise.

A telephone line may have a voltage induced *in series or along* the line wires, or may have its wires raised to a voltage *above ground*. These two effects usually occur together. These voltages may cause noise currents to flow.

Transpositions in the telephone line wires tend to equalize the voltage of each wire, and thus reduce noise. Voltage to ground may exist on a well-transposed telephone line, however, and this voltage may act through series unbalances in the line wires or unbalances to ground to cause noise.

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"Fire" Calls Connected to Fire Department

The Champaign Telephone Co., of Urbana, Ohio, has changed its system whereby a call made by telephone to report a fire is now immediately connected with the fire department, instead of waiting until the operator first contacts the supervisor. In addition to this change, equipment has been installed in the fire chief's residence, so that if he happens to be at home he will hear the report simultaneously.

DRIFTING SNOW IN MINNESOTA

Created Real Problems for Telephone Men. These Scenes Show Road Conditions Around Mankato, Minn., Where the Mankato Citizens Telephone Co. Operates. Linemen Handling Rural Line Troubles, Went as Far as They Could in the Company Truck and Then Used Skiis. P. M. Ferguson is General Manager of the Company. He and His Men Worked Especially Hard to Keep the Service Going Despite Many Difficulties, For Telephone Service Was Greatly Needed.

The Center Photograph Shows a Telephone Pole Having Three Crossarms, the Bottom One Being Completely Buried Under the Snow. This is an Excellent Example of How the Snow Swirled Around Telephone Poles, Forming Huge Snowdrifts and Complicating the Job of Clearing Rural Line Troubles. These Scenes Are Typical of Conditions Which Prevailed in Many Sections of the Country During the Past Few Months When Frigid Temperatures and "Mountains" of Snow Collaborated to Make This the Coldest Winter in Many Years—a Real Old-Fashioned One.

Long Distance Telephone-Television in Germany

On March 2, a two-way telephone-television circuit was opened between Berlin and Leipzig, Germany. The service is the first step in the development by the German post office of a regular long distance telephone-television system linking the cities of Germany. The present service is intended to be offered for the duration of the Leipzig Fair, which also opened on March 2.

Residents of Berlin wishing to speak face-to-face with Leipzig residents go to the central office where two television booths are located. There are also two booths in Leipzig, 100 miles distant. The Berliners using the equipment can see as well as talk to the Leipzig residents.

The speaking apparatus used is a regular desk telephone instrument. About 12 feet in front of the desk set is a screen approximately 8½ square. The booth is in semidarkness. The image on the screen of the party at the other end of the circuit was easily discernible. The movements of his mouth and face as he talked and laughed were clearly made out.

Each "picture" transmitted is made up of 40,000 points and 25 of these pictures are sent per second, making 1,000,000 points transmitted per second each way, or 180,000,000 during each three-minute conversation.

The cost of a telephone-television call from Berlin to Leipzig is said to be approximately $1.40 for three minutes.

▼ ▼

Death of Pioneer with Callender Automatic System

William Chrysler Andrews, age 72, of Brantford, Ont., Canada, passed away on February 3. In his earlier years, Mr. Andrews was associated with his brother-in-law, the late Romaine Callender of Brantford and of Piqua, Ohio, in the development of the Callender automatic telephone system, with head offices in both of those cities.

The Callender automatic telephone system was first demonstrated publicly in New York City on January 23, 1895, and subsequently in Chicago. Its earliest installations were made in Bay City, Mich., Piqua and Troy, Ohio, and at Brantford, Peterborough, Lindsay, St. George and Burford in Ontario, Canada.

The Callender system (later known as the Lorrimer system and taken over by two brothers, G. W. and Hoyt Lorrimer, of St. George, Ont.) flourished until 1923 when an assignment was made. On August 1, 1925, the Bell Telephone Co. of Canada acquired the assets from the trust company which had taken over affairs in the bondholders' interests.

Definite Progress Noted In Bell System's Annual Report

A RECORD YEAR in the attainment of high service standards, an increase of nearly a half-million telephones, an increase in toll and long distance traffic and an increase of 17 million dollars in net earnings—these are some of the highlights in the annual report of the American Telephone & Telegraph Co. for the year 1935. President Walter S. Gifford points out reasons for anticipating expansion of telephone industry

ANALYSIS of the 1935 annual report of the American Telephone & Telegraph Co., as submitted to the stockholders by President Walter S. Gifford for the company's directors and made public March 2, indicates that there is a growing demand for telephone service in the United States and gives promise that the telephone business will again be an expanding industry in the not far distant future.

On December 31, 1935, the Bell System had 13,844,000 telephones in service, an increase of 466,500 stations (3.4 per cent) over the preceding year as compared with an increase of 298,000 stations in 1934 (an increase of 2 per cent over 1933). In other words, the Bell System in the past two years regained more than 30 per cent of the losses sustained during the depression, but still has to gain 1,746,000 telephones to attain its maximum development reached in 1930. There was an increase of 4.1 per cent in local calls and an increase of 4.6 in long distance and toll traffic during 1935.

Including telephones operated by Bell connecting companies and connecting rural lines, there were in the United States at the close of 1935 approximately 17,350,000 telephones, practically any one of which can be promptly connected with any other. Furthermore, 67 overseas countries may now be reached by telephone as compared with 60 at the close of 1934.

The total number of Bell and connecting telephones now in service represents about 86 per cent of the peak development of 20,201,000 reached at the close of 1930. The low point was reached in August, 1933, the Bell System report for that year showing 13,162,905 telephones operated by its subsidiaries and a total of 16,600,000 including connecting telephones.

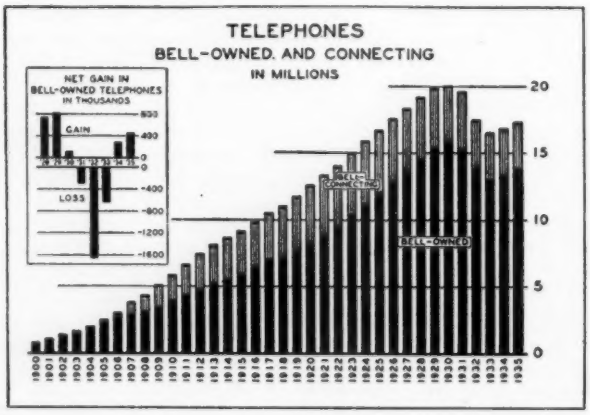
Operating revenues of the Bell System in 1935 were $934,400,000 and total operating expenses, $651,400,000. Taxes were $95,900,000. Operating earnings after taxes were $187,000,000 and other earnings, $12,900,000. The total net earnings before deducting interest and dividends were $199,900,000, an increase of $17,000,000 over 1934.

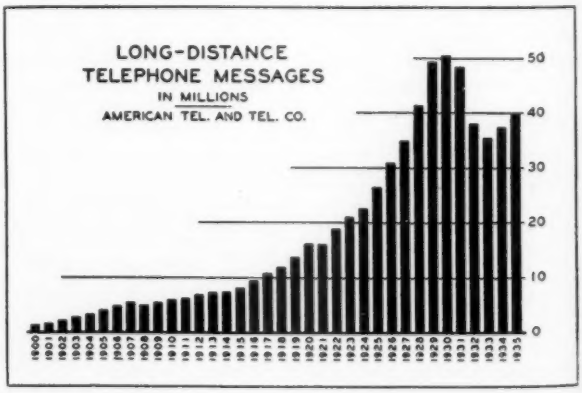
The net income of the Bell System, applicable to stock of the A. T. & T. Co., was $132,794,782, or $7.11 per share, compared with $5.96 in 1934. This was short of dividends paid in 1935 by $35,165,693; this amount was taken from surplus.

On December 31, 1935, the company's surplus, including $64,664,000 reserved for general contingencies, was $248,403,000. This surplus, together with its proportion of the surplus of its associated companies and other controlled companies including the Western Electric Co., Inc., and its subsidiaries, amounted to $19.02 a share, of which $4.61 a share is reserved for contingencies.

At the end of 1935 the A. T. & T. Co. had 657,000 stockholders. They owned 18,662,275 shares of stock for which the company has received $268,749,078 in excess of par, or an average of $114.40 per share. Thus the stockholders' investment, including the $19.02 per share equity in surplus, is $133.42 per share. The $9 per share dividend was at the rate of 6.7 per cent and the $7.11 per share earned was 5.3 per cent on this investment.

The average number of shares held per stockholder was 28. More than half of the stockholders are women and no stockholder owns as much as one per cent of the total





stock, the report states. More than one-third of Bell System employes (90,000) own stock in the company.

Taxes continued to increase during the past year. The total of $95,900,000 was at the rate of $7.06 per year per telephone in service. As a result of legislation passed in 1935, federal taxes alone will be increased in 1936 by about $9,000,000 of which some $4,000,000 is the new tax for unemployment compensation.

The report states that "there has been a steady improvement in the uniformity of service with 1935 as a record year."

"The high standards of telephone service were fully maintained in 1935, and further improvements were made," the report continues. "Despite the necessity for all practicable economies during the depression, service which was good in 1929 was substantially better in 1935.

"During 1935, 83.1 per cent of all local calls were completed on the first attempt as compared with 80.9 per cent in 1929. . . . In these six years operating errors on local calls decreased 40 per cent; dial service improved through a 12 per cent decrease in irregular uses by the person dialing and a 40 per cent decrease in operating and equipment irregularities.

The average time required for long distance connections was reduced from 2.8 to 1.4 minutes and 92 per cent of these calls were handled while the person calling remained at the telephone, as compared with 71 per cent in 1929.

As a result of these and other betterments, 750,000,000 calls, or about 3 per cent of the total calls in 1935, were handled with much more satisfaction to telephone users than would have been the case in 1929. That this improvement is appreciated is evidenced by the commendations received from users and by the fact that criticisms of local and toll service in 1935 were less than one-third those in 1929. . .

A subscriber's line and telephone were in trouble on the average only once in 23.6 months, as compared with 20 months, and the percentage of troubles cleared on the day reported increased from 87 to 96. The percentage of long distance calls affected by unsatisfactory transmission was reduced nearly one-half.

Service in telephone company business offices improved in all respects. Accuracy of telephone di-

President Walter S. Gifford of A. T. & T. Co. Sees a Widening Future Demand for Telephone Service

"NOW THAT the forces of depression are on the wane, there is every reason to expect that a widening demand for telephone service will be experienced in the future; the fact that there have been substantial net gains in the number of telephones in service during the past two years is impressive evidence on this score.

There are many fundamental factors operating to stimulate telephone expansion. The population of the country is still increasing and, with a substantial decline in immigration, the increase is more largely among that part of the population which has always provided the best market for telephone service.

The adult population, moreover, is growing faster than the total population. Furthermore, it is to be expected that the persistent trend toward ever higher standards of living will be resumed as it has been after previous depressions. This trend will bring a demand for telephone service on the part of new groups of the population.

The use of toll and long distance telephone service will be promoted not only by an increase in subscribers, but also by the greater mobility of the population, as a result of which communication needs are spread over a larger area than ever before. Business organizations are more and more finding that selling and buying can be efficiently and economically effected by use of the telephone."

	Dec. 31, 1915	Dec. 31, 1920	Dec. 31, 1925	Dec. 31, 1930	Dec. 31, 1935	Increase* During 1935
Number of telephones†	5,919,462	8,277,600	11,974,405	15,583,101	13,844,663	466,560
Number of central offices	5,300	5,702	6,017	6,585	6,787	18
Miles of pole lines	330,602	358,091	386,064	422,489	390,133	*3,671*
Miles of wire:						
In underground cable	10,573,000	15,748,000	30,483,000	50,225,000	52,682,000	119,000
In aerial cable	4,602,000	5,885,000	10,672,000	20,785,000	23,259,000	331,000
Open wire	3,331,000	3,744,000	4,319,000	5,238,000	4,517,000	*110,000*
Total	18,506,000	25,377,000	45,474,000	76,248,000	80,458,000	340,000
Per cent total wire mileage in cable	82.0	85.2	90.5	93.1	94.4	.....
Average daily telephone conversations:‡						
Exchange	25,184,000	31,836,000	46,702,000	62,365,000	58,809,000	2,323,000
Toll and long distance	819,000	1,327,000	2,098,000	2,933,000	2,276,000	100,000
Total	26,003,000	33,163,000	48,800,000	65,298,000	61,085,000	2,423,000
Total plant§	$889,413,000	$1,386,083,000	$2,568,631,000	$4,122,206,000	$4,266,584,000	$18,398,000
Number of employes††	156,294	231,316	293,095	324,343	244,599	*4,358*
Number of A. T. & T. Co. stockholders	65,512	139,448	362,179	567,694	657,465	*17,562*

* Decreases shown in italics.

† Excludes private line telephones numbering 78,638 on December 31, 1935. Including telephones of 6,600 connecting companies and 25,200 connecting rural lines, the total number of telephones in the United States which can be interconnected is approximately 17,350,000.

‡ For year ending December 31.

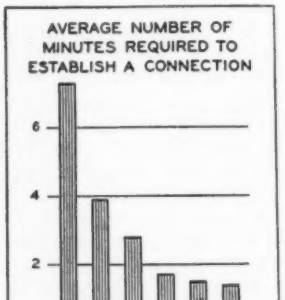
§ Includes general equipment.

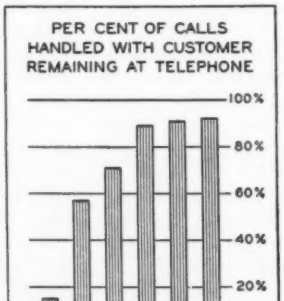
†† The employes of the Western Electric Co., Inc., and the Bell Telephone Laboratories, Inc., numbering 25,305 on December 31, 1935, are not included.

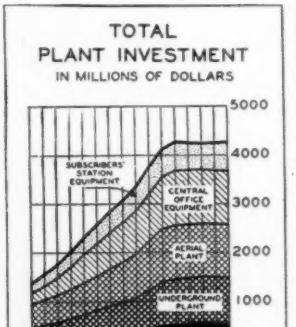
Bell System Statistics for 1935 With Comparative Figures for Five-Year Periods Beginning With 1915.

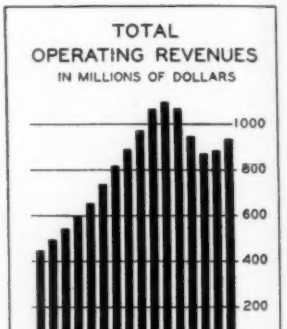
Assets	Dec. 31,1935.	Liabilities	
Investments:		Capital stock:	
Stocks of associated companies	$2,015,145,130	Stocks issued and outstanding (authorized $2,500,000,000)	$1,866,227,500
Stocks of other companies	170,216,162	Premiums	268,749,078
Notes of, and advances to, associated companies	116,343,923	Capital stock installments	4,330,337
Other notes and advances	20,850,841	Long-term debt:	
Sinking funds	1,202,573	Bonds and debentures	443,532,600
Plant and equipment:		Notes sold to trustee of pension fund	11,022,113
Long lines plant	435,270,512	Current and accrued liabilities:	
General equipment	1,073,730	Dividend payable	41,990,119
Current assets:		Accounts payable	3,416,838
Cash and deposits	18,236,185	Interest and taxes accrued, not due	11,263,579
Temporary cash investments	194,339,659	Deferred credits	1,775,453
Current receivables	13,010,977	Reserves for depreciation of plant and equipment	95,040,546
Material and supplies	8,381,309	Surplus:	
Deferred debits	1,680,878	Surplus reserved	64,664,444
		Unappropriated surplus	183,739,272
Total assets	$2,995,751,879	Total liabilities	$2,995,751,879

Balance Sheet of the American Telephone & Telegraph Co. as of December 31, 1935.









rectories was good in 1929, but there were 45 per cent fewer errors in 1935."

With regard to broad band transmission developments and two-way radio telephony the report states:

"Research and development work progressed satisfactorily on broad band systems of transmission which will provide an increased number of independent communication channels over existing types of open-wire and cable circuits. Work on the terminal and intermediate equipment for these systems and for the radically new form of transmission cable, referred to in the system's 1934 annual report, was also vigorously pushed during the year.

While a considerable number of miles of this cable have been satisfactorily manufactured and a mile or so has been successfully installed, the large trial installation referred to last year has been somewhat delayed.

During the year the original long wave radio circuit between New York and London was equipped with an improved five-band privacy system designed still further to enhance the privacy of two-way radio telephony. In addition to increasing the number of bands in the privacy system, the equipment now under service trial is provided with synchronous switching at each terminal for frequently changing the arrangement of the bands and thus still further decreasing the liability of intelligible overhearing."

Commenting upon the destruction wrought by hurricane on the Florida Keys last fall, the report comments upon the emergency service set up within a few days by bridging the gap in the wire lines temporarily with small radio telephone transmitting and receiving sets,

Assets	Dec. 31, 1935	Liabilities	Dec. 31, 1935
Telephone plant	$4,266,584,160	Capital stock (par value outstanding held directly by public)	$2,096,144,243
Includes also on December 31, 1935, organization and franchise costs — $1,915,833, and undistributed cost of property—$8,321,103.		Premiums on stock, A. T. & T. Co.	268,749,078
Investments in controlled companies (not consolidated)	231,875,128	Stock installments, A. T. & T. Co.	4,330,337
Other investments	79,056,566	Long-term debt	1,078,377,463
Sinking and other reserved funds	47,999,117	Current and accrued liabilities	181,637,053
Current assets	353,350,421	Deferred credits	3,491,424
Deferred debits	25,486,974	Reserves for depreciation of plant and equipment	1,061,102,083
		Other reserves	1,619,919
		Equity in consolidated surplus	8,914,411
		Surplus reserved	86,043,049
		Unappropriated surplus	268,943,306
Total assets	$5,059,352,366	Total liabilities	$5,059,352,366

Balance Sheet of the Bell System as of December 31, 1935, Including Accounts of the American Telephone & Telegraph Co. and Its 23 Associated Companies.

Operating Revenues	Year 1935
Toll service revenues	$78,092,813
License contract revenues	12,635,358
Miscellaneous revenues	4,044,862
Less: Uncollectible operating revenues	523,590
Total operating revenues	$94,249,443
Operating Expenses	
Current maintenance	$15,284,241
Depreciation expense	17,492,018
Traffic and commercial expenses	7,691,464
Provision for employes' service pensions	905,348
Employes' sickness, accident, death and other benefits	456,733
Operating rents	11,826,107
General and miscellaneous expenses	18,932,890
Less: Expenses charged construction	81,514
Total operating expenses	$72,507,285
Net operating revenues	$21,742,158
Taxes	5,879,722
Operating earnings	$ 15,862,436
Dividend revenues	121,244,200
Interest revenues	11,289,498
Miscellaneous non-operating revenues—net	840,392
Total net earnings	$149,236,526
Interest deductions	23,430,021
Net income	$125,806,505
Dividends declared	$167,960,475
Dividends at the rate of $9.00 per share per annum on capital stock:	
Charged against net income	$125,806,505
Charged against surplus	42,153,970

Condensed Earnings Statement of the Bell System as of December 31, 1935.

which had been developed for air plane use. That such sets were available is an illustration of the value to the ordinary services of communication of prosecuting research and development work in the adjunct services, says the report.

In commenting upon the net income for 1935—$132,794,782, or 5.3 per cent on the stockholders' investment, which averaged over $2,500,000,000 during the year, President Gifford says:

"The company's total net earnings from all sources must in the long run be adequate to maintain the financial safety of the business; and it is the policy of the management that earnings beyond this requirement be spent for the enlargement and improvement of the service furnished, or the rates charged for the service be reduced.

"Not only is it necessary to have the total net earnings from all sources adequate and reasonable but also to have the elements of cost of the service distributed equitably within the system. It is perhaps inevitable that this question of distribution of cost, which involves in many cases transactions between system companies, should constitute a substantial part of the controversial matters of rate regulation.

However, nation-wide telephone service requires the integration of many factors which in other enterprises might be handled effectively by scattered independent units. Without such integration it would be impossible to provide the kind and quality of telephone service that the people of the country want and are accustomed to receive.

The efforts of the management, therefore, are at all times directed toward seeing that transactions between the companies in the Bell System are fair and reasonable so that the costs of furnishing telephone service are equitably distributed."

Relative to the use of handsets and charges therefor, the report says:

"The handset type of telephone was tried a great many years ago but, notwithstanding its convenience, it was not put into general use in the Bell System because of the inability to make it perform as reliably as the deskset type. After a long period of intensive development work, these service difficulties were overcome and the Bell System offered the handset to its customers on an optional basis in 1927.

The monthly charges for handsets then established have been reduced from time to time and it is the policy of the Bell System companies to continue to reduce these charges as conditions in various states permit, until they are entirely eliminated. At the end of 1935 there were about 4,850,000 handsets in service. Total reductions in Bell System telephone rates made effective during 1935 amounted, on an annual basis, to about $4,700,000."

With reference to the investigation of the Bell System now under way by the FCC pursuant to the joint resolution adopted by Congress in March of last year, the report said:

"Clearly, the public is entitled to the fullest information as to how the affairs of the system are conducted; however, such investigations are costly both to the investigator and the investigated and they inevitably interfere more or less with the normal day-to-day work so essential to satisfactory business performance. Every effort is being made to facilitate the progress of the present investigation in order that it may be completed as promptly as practicable."

Commenting upon the provision of the Communications Act of 1934 that no person shall serve as officer or director of more than one communication company subject to the jurisdiction of the act without authorization by the FCC, the report states that no longer are any of

Operating Revenues:	Year 1935
Local service revenues	$640,993,436
Toll service revenues	273,483,256
Miscellaneous revenues	23,724,799
Less: Uncollectible operating revenues	3,830,619
Total operating revenues	$934,370,872
Operating Expenses	
Current maintenance	$175,469,287
Depreciation expense	171,681,516
Traffic expenses	131,839,788
Commercial expenses	74,541,595
General and miscellaneous expenses	95,053,508
Operating rents	13,186,203
Total operating expenses	$651,429,009
Net operating revenues	$282,941,863
Net operating revenues (continued)	$282,941,863
Taxes	95,923,952
Operating earnings	$187,017,911
Other earnings—net	12,893,670
Total net earnings	$199,911,581
Interest deductions	52,372,527
Net income	$147,539,054
Dividends on preferred stock of associated telephone companies held directly by public	$ 6,425,085
Net income applicable to common stock of associated telephone companies held directly by public	8,319,187
Net income applicable to A. T. & T. Co. stock	$132,794,782

Condensed Earnings Statement of the A. T. & T. Co. as of December 31, 1935.

The Operators' Corner

By MRS. MAYME WORKMAN

Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

CUSTOMERS should always be advised when the classification of a call changes and a high rate is applicable. Series 232

IN ANSWER to question No. 1, the time on a collect call is not always rated the same as that on a person-to-person call, although in many instances as much toll circuit and operator's time is involved as in the completion of a person-to-person call. If a station-to-station call is placed collect and the rate is less than 20 cents, the call is subject to the person-to-person rate. If the day station-to-station rate is 20 cents, the call will take the special collect station-to-station rate of 25 cents.

It is reasonable to assume that inasmuch as it is necessary to do practically the same amount of work on a collect station-to-station call as on a person-to-person call, where the day station-to-station rate is less than 20 cents, the company needs some additional revenue to compensate it for the amount of operator's work time as well as for the additional use of the toll circuit.

On station-to-station calls, where the day station-to-station rate is more than 20 cents, the classification of the call does not change if the customer requests the operator to reverse the charge.

Occasionally the calling party will request the operator to make his call collect after the finish of conversation. In this case if a particular party were not specified on the call and the day station-to-station rate to the called place is less than 25 cents, the operator will determine the charge and say: "If I try to make this call collect the charge will be (amount)."

It is very important to advise the customer in every case where a higher rate is involved on his call. This gives him the option of talking on the call or canceling it as he may choose and will avoid dissatisfaction and complaint when the customer receives his bill.

In handling calls we should always bear in mind that a satisfied customer is the best possible advertising medium. Do not take a chance of losing his good will by a careless act or omission.

Questions from Illinois Operators

1. Why is the time on a collect call rated the same as that on a person-to-person call?
2. When a person places a long distance call, giving address name and number, when the party answers, which is correct to say, "Is this 545 L?" or "Is this John Brown's residence?"
3. If some one calls in and requests a telephone installed, what is the correct way for the operator to handle the call?
4. Two lines belong to one subscriber. He calls from one line asking for the other. It is busy. What should the operator do then?
5. If the calling line is busy when you try to secure it to complete a long distance call, what attempts should be made to reach the calling line?

The answers to these traffic questions are given on page 32.

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the officers or directors of the A. T. & T. Co. on the boards of directors of its subsidiary operating companies.

Regarding Western Electric sales during the past year, the report indicates that its manufacturing subsidiary had net earnings of $2,620,279 in contrast with a net loss of $7,751,548 in 1934. Its sales during the past year were $105,400,000 as compared with $91,800,000 in 1934, an increase of 14.8 per cent. They were only slightly more than one-fourth of the 1929 peak of $411,000,000.

By the close of 1935 a total of 7,241 employes had been retired on pension rolls of the Bell System Companies, including the Western Electric Co. and the Bell Telephone Laboratories. These companies also paid out $4,481,000 in sickness disability benefits, $1,746,000 in death benefits and $332,000 in disability benefits.

On December 31, 1935, the Bell System had 270,000 employes, with an annual payroll of $438,835,000, an increase of $18,875,000 over 1934.

In concluding his analysis of the past year's operation of the Bell System, Mr. Gifford makes these interesting observations on the industry's future:

"Now that the forces of depression are on the wane, there is every reason to expect that a widening demand for telephone service will be experienced in the future; the fact that there have been substantial net gains in the number of telephones in service during the past two years is impressive evidence on this score.

There are many fundamental factors operating to stimulate telephone expansion. The population of the country is still increasing, and, with a substantial decline in immigration, the increase is more largely among that part of the population which has always provided the best market for telephone service. The adult population, moreover, is growing faster than the total population. Furthermore, it is to be expected that the persistent trend toward ever higher standards of living will be resumed as it has been after previous depressions. This trend will bring a demand for telephone service on the part of new groups of the population.

The use of toll and long distance telephone service will be promoted not only by an increase in subscribers, but also by the greater mobility of the population, as a result of which communication needs are spread over a larger area than ever before. Business organizations are more and more finding that selling and buying can be efficiently and economically effected by use of the telephone.

Over and above all these factors, there is the influence, on the one hand, of continuous and systematic research to discover and perfect improvements in the telephone art and its instrumentalities and, on the other hand, of research to assure that service is continuously adapted to the developing needs of the public.

The courage, skill, and enthusiasm with which the personnel of the Bell System have met the problems of the depression is assurance that the change to an again expanding business will be met successfully and that telephone service in the United States will continue to be what it is generally acknowledged to be—the best in the world."

IN THE NATION'S CAPITAL

By FRANCIS X. WELCH.
Special Washington Correspondent for TELEPHONY

NOW THAT the Federal Communications Commission has gotten the coaxial cable case off its chest, we shall probably be flooded with all sorts of yarns about television. As a matter of fact, according to the commission's findings, the Bell System will build this experimental cable between Philadelphia and New York primarily for multi-message telephone experiments.

The fact that the proposed cable will afford a frequency band of approximately 1,000,000 cycles, and perhaps even more upon subsequent improvement, is said to be only coincidental with the fact that such high capacity equipment is adaptable to the art of television, as known at present.

The chief purpose of the cable, according to the testimony of Bell's technical expert and vice-president, Dr. Frank B. Jewett, is to devise ways and means for handling more long distance telephone traffic load in the future. The proposed single cable "will permit 240 telephone circuits to be operated simultaneously, or 10 to 20 times as many telegraph circuits, or various combinations of both."

At present there is no need for additional telephone channels between New York City and Philadelphia, but Bell estimates of prospective traffic, due to increases in both customers and per customer use, indicate that there will be a need for such additional equipment as early as 1941.

THIS BRINGS up the interesting factor of population growth that vitally concerns the telephone industry, the motor industry, and indeed almost every business imaginable. In the Bell Telephone Quarterly of last October, was published an interesting article on the changes in birth and death rates as affecting population growth. During that same month the National Resources Committee here in Washington issued a report speculating on the economic and industrial changes that will follow our apparent population trend.

Twenty-five years from now, we are told, there will be twice as many persons over the age of 60. We shall probably be using the automobile less, sitting at home more, reading good books, listening to the radio, looking at television, and "visiting" more by telephone. This means we shall have a slower national tempo. Older people will conduct our national affairs.

A good example of this state of affairs is found in France which, 25 years ago, had already attained the status now predicted for us 25 years hence. For a picturesque example, consider the fact that in a theatre seating 1,000 people, a chorus girl ogles three middle-aged men in France for every two in America. Economically, that makes a vast difference.

It might make a vast difference politically as well. An older population means more conservative political policies. The curious angle about this situation, the New York Times has astutely observed, is the fact that "it is the young people who drill and goose-step and salute and demand to be coordinated and collectivized and deprived of freedom of thought and action, all for the sake of being made secure." Conversely, it appears to be the oldsters who hold out for individualism and self-reliance and attendant risks.

It seems that modern youth has small patience with such old-fogy reactionaries. In Russia they are "liquidated." In Japan they are "eliminated." In Washington they are investigated, and sometimes castigated, by smart young fellows who seem to have a burning passion to be made "secure."

EVEN SO, Washington is a pretty good place to find out what's going on, not only in the rest of the United States but in the rest of the world as well. But don't make the mistake of going to the embassies or legations for information. There one is met by polite evasion. Either "His Excellency" does not know what you are talking about, or he is not "permitted" to discuss it. Generally, he doesn't know—particularly if you are looking for industrial information.

It is a little known fact that our own Bureau of Foreign and Domestic Commerce has far more accurate and complete data on such matters as utility service density in foreign cities than the Washington diplomatic representatives of the countries in which these cities are located.

Believe it or not, the wife of an attaché of the French Embassy, who was about to return home, actually called our own bureau to find out if a certain section of Paris had direct or alternating current. She wanted to take an American appliance over with her. She got the information.

However, it is the foreign newspaper correspondents who are the wise fellows. They will talk freely if they are approached in the right spirit. If you want a Britisher to talk, for example, you have to drink a "dish of tea" with him at an ungodly hour in the afternoon. A German newshawk is more amenable in a taproom about midnight.

But, in any event, here they are—a talented band, gathered in Washington from all corners of the earth for the purpose of gathering news (and, occasionally, dispensing it.)

It was right after the coaxial cable decision of the FCC that your correspondent hunted down a British correspondent in his favorite tea den, located near the State Department.

The information wanted just then concerned English television. What was there to all these stories one hears about the British being so far ahead of us on television—about the British Broadcasting Co. ("BBC" to natives) getting out receiving sets for 25 pounds—about television being an accomplished fact in every-day use in London and elsewhere as well? Is it really a success? Who's putting up the money? Has the movie trade dropped off in England? Are telephone circuits being used?

The Londoner listened solemnly through this barrage of questions and then, politely baring his fangs at a peculiar-looking cookie of a sort which he devours in great quantities, shrugged his shoulders and answered simply:

"Poppycock! Sheer poppycock, my dear fellow; I really don't know how these silly tales get about."

Getting down to details, here is the thumbnail sketch of English television as told to your correspondent:

The government broadcasting company—BBC—derives its income

DUTY

By MISS ANNE BARNES

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

"Duty" has been defined by friend Webster as, "That which is required by one's station or occupation; or, that which one is normally bound to do."

I know a young woman who does not have this slant of her duty to her company. She acts and talks about the *hours* she puts in as though they were more important than what she *puts into them.* She manages to work in her personal affairs, such as chatting with a friend over the telephone, or getting away from her desk to keep a dentist appointment. Although she has an afternoon off once a week she wouldn't think of making a dentist appointment on that afternoon off.

She is never quite up-to-date in her work and sometimes has to hurry to finish it at the last minute. Then she complains she is over-worked. If she did not use so much of her time for personal matters she would be able to do her work unhurriedly and well. We all know how easy it is to put something aside to be done later. When we get around to it again, seven fresh duties are needing attention. That is the reason mistakes occur.

MORAL: "It is an undoubted truth, that the less one has to do, the less time one finds to do it in. One yawns, one procrastinates, one can do it when one will, and, therefore, one seldom does it all; whereas, those who have a great deal of business must buckle to it; and then always find time to do it in."—Chesterfield.

from taxes on radio sets. Two years ago, when their technicians thought that television was about ripe for some practical application, tentative plans were made for building 50 or more television stations in various parts of England. Television waves being greatly limited in effective penetration, it would require that many stations to serve the entire population, even in an area as comparatively compact as England.

The first station is now being installed in Alexander Palace, formerly an exhibition hall, situated in North London. About a million dollars were allocated for the establishment and maintenance of this station through the year 1936. Fifty per cent was donated by the British treasury and 50 per cent by the BBC from its regular income.

What happened? The station is not finished yet, and the money is about gone. The balance now available for programs and staff salaries will have to be provided from the general fund of the BBC.

SO DISAPPOINTING has been the experiment so far and so great the cost that the whole question of British television finance is, temporarily, in the balance. The Alexander Palace station should get into shape about June and will broadcast only three hours daily.

Just when the next step—ten more stations—will be taken is not definitely known. They will undoubtedly cost even more than Alexander Palace. Millions will be required to finance such developments, and meantime BBC must continue the maintenance of its ordinary sound service. A forthcoming BBC report to Parliament is expected to present a rather sorry picture of the venture.

The trouble appears to be that the British have gone ahead too fast. The receiving sets available (for nowhere near 25 pounds, incidentally) are likely to be obsolete before two years are out. Even at present their performance is so erratic that BBC has its fingers crossed every time television receiving set sales are mentioned.

As for competition with theaters, the present state of the British art indicates that such a probability is far in the future. Only limited images and detail can be transmitted. The transmission of such panoramic scenes as the Triumphal March of the Priests from the opera "Aida," for example, is utterly out of the question.

Having concluded the frank discussion with the Britisher, your correspondent sought out a Berlin journalist who was lounging about the National Press Building. What was the latest word from the Reichland on television?

He volunteered the information that Germany's first commercial long distance telephone and television lines between Berlin and Leipsig (about 100 miles) was opening that very day—March 2. The German post office, which handles such matters, has tested the cable.

It appears that Germans have been developing television more along the lines of telephony, as well as the radio technique being used in England. The results are said to be superb as far as clarity and sensitivity are concerned, but the problem of receiving distribution has yet to be solved. For the present the service between Berlin and Leipsig is limited to four booths, two at each end of the cable.

NO ONE SEEMS to know yet when the Federal Communications Commission will open up hearings on its special Bell investigation. The latest rumors are that they will start about April 1, but it is far from certain.

The commission may be uncomfortable about the presence of some of its critics in Congress and may wait until the House and Senate start thundering down the home stretch towards the finishing line before it opens up its own show. When Congress even smells adjournment, it usually has no time to pick on bi-partisan boards, even if it is an election year.

TELEPHONE MEN will be interested in the latest lobby in Washington. It is none other than the dusky representative of Father Devine, noted Harlem evangelist, who is said to identify himself with the Deity. Father Devine's political program is called the International Righteous Government.

One of its platform planks demands legislation to substitute the Devine password "Peace" for "Hello" on the telephone. The office of Arthur W. Mitchell, Democrat of Chicago, and only negro in Congress, declined to comment on whether he would introduce such legislation. He probably won't—unless Father Devine moves to Chicago.

▼ ▼

Recent Prices in the Metal Markets

New York, N. Y., March 2: Copper—Quiet; electrolytic spot and future, 9.25@9.50c per lb.; export, 8.95c. Tin—Barely steady; spot and nearby, 48.00@48.12½c per lb.; future, 46.25@46.37½c. Iron—Quiet, No. 2 fo.b. Eastern Pennsylvania, $20.50 per ton; Buffalo, $19.50; Alabama, $15.50.

Experimental Coaxial Cable Installation

FCC issues new order authorizing A. T. & T. Co. to install test coaxial cable between New York and Philadelphia. Conditions of the order. Cable must be open for television experiments. Bell's interest is in telephone and telegraph uses of the new cable

THE FEDERAL Communications Commission on February 26 authorized the American Telephone & Telegraph Co. and the New York Telephone Co. to install a coaxial cable for experimental purposes between New York City and Philadelphia. This order vacates the commission's report, finding and order of July 24, 1935 (TELEPHONY of August 3, 1935).

The authority is given upon the express condition that installation of the coaxial cable system shall be commenced on or before July 1, 1936. Dr. Frank B. Jewett, vice-president of the American Telephone & Telegraph Co., and president of Bell Telephone Laboratories Inc., in announcing acceptance of the order by the A. T. & T. Co., said work will start immediately on construction of the coaxial television-telephone cable.

The coaxial cable in addition to its possibilities for transmitting some 240 telephone conversations simultaneously, or 10 to 20 times that number of telegraph messages, will handle any kind of television yet known, according to testimony at one of the hearings.

The commission stipulated that the facilities of the coaxial cable for television purposes shall be open to those radio companies interested in experimenting, which are equipped with suitable facilities and that the A. T. & T. should show no unreasonable preference between those who may seek to use the cable for television experiments.

The television laboratories of the Philco, Farnsworth and RCA companies are all in Philadelphia, and for this reason it was considered advisable to permit the cable, which the commission declared "has passed beyond a laboratory experiment," to be constructed between that city and New York.

The company must report on the progress of construction of the cable and on tests conducted with it each 60 days. In addition, it must submit complete quarterly reports comparing performance of the cable with results obtained over regular telephone facilities between New York and Philadelphia.

The order contains no reference to the development of patent rights and makes clear that the A. T. & T. need not divulge inventive secrets in its reports to the FCC on the progress of the installation.

The report removed many of the restrictions contained in a previous order to which the petitioners objected. The petitioners, for instance, now have the right to carry on limited and incidental commercial telephone and telegraph service for "trial" purposes.

The commission on October 30, 1935, granted a petition of the A. T. & T. for reargument of the commission's order of last July, for the purpose of giving further consideration to (a) the extent under the law of the commission's jurisdiction in the premises; and (b) the question of whether the terms and conditions of that finding and order should be modified in any respect.

In this original application, in their arguments before the commission and in their petition for reargument, the petitioners contended that the commission is without jurisdiction to pass upon the application, primarily because the proposed cable installation is said to be purely an experimental enterprise and that the provisions of section 214 of the Communications Act of 1934, do not apply.

In their final argument, counsel for the petitioners indicated that regardless of their contention of want of jurisdiction, they would not contest an order of the commission if the terms and conditions were acceptable to them.

"This is an unsatisfactory method of handling the application," says the commission, "and we feel it our duty to pass squarely upon the jurisdictional issues presented before considering the merits of the application. Section 214 (a) provides that:

> No carrier shall undertake *the construction of a new line* or of an extension of any line, or shall acquire or operate any line, or extension thereof, or shall engage in transmission over or by means of such additional or extended line, *unless* and until there shall *first have been obtained* from the Commission a *certificate* that *the present or future* public convenience and necessity *require* or will require *the construction, or operation*, or construction and operation, *of such additional* or extended *line*. . . .

The original petition states that 'ultimately it is expected the experimental facilities will be in full time communication service for hire.'

The whole ground of petitioners' contention that we are without jurisdiction is based upon their theory that the new line is now experimental and that until they seek permission to place it in commercial use this commission is without jurisdiction. Obviously, if the commission is to consider the public convenience and necessity of any construction, it must do so before the construction is undertaken, else the very purpose of serving the public's interest, and of avoiding needless waste by the carriers is thwarted.

The scientific principles of the coaxial cable have been known nearly as long as the electrical communications art. This is merely a new adaptation. The proposed installation represents a new line designed for common carrier service in the transmission of 'writing, signs, signals, pictures, and sounds of all kinds by aid of wire, cable, or other like connection,' as set forth in Section 3(a) of the Act."

The testimony developed at the further hearings in November and January was so broadened in scope as to include the present and future commercial, as well as experimental, aspects of the application for a certificate. The prior report, findings and order are, therefore, vacated by the new order.

"The petitioners," says the commission, "became actively engaged in the development of the coaxial cable system about 1927 and since that time have carried out a vast program of development and research pertaining to this system or, more generally speaking, a program for the development of wide band transmission. They have patented a number of alternative forms of the coaxial cable and have obtained a large number of patents on devices pertaining to the transmission and terminal apparatus associated with the coaxial cable system.

"The petitioners over the years 1927-1935, inclusive, have expended more than a million and a half dollars on the development and research of wideband transmission, including the specific coaxial cable system proposed for installation. It is also of record that independent inventors have patented other forms of the coaxial cable for use in the transmission of voice frequencies and related purposes; and that companies independent of the petitioners have developed and patented a number of devices whereby television can be effectively transmitted over coaxial cable.

In view of the extensive research and development work carried out by peti-

tioners and by the independent companies, as to coaxial cable transmission, and the patents obtained upon such development, it appears conclusive that coaxial cable for wide-band transmission has passed beyond being a laboratory experiment.

The petitioners request permission to substitute from time to time the proposed system for some of the existing transmission facilities between New York and Philadelphia during the test period, and do not wish to be limited as to time for such test. This extended use of the proposed coaxial system for commercial messages will represent the adaptation or standardization of said system to the services for which it may be capable. The proposed construction is interstate in character.

The commission finds that it has jurisdiction of the petitioners' application as follows: (1) the proposed construction or installation; (2) the incidental commercial use of the cable during the time the proposed system is substituted for existing transmission facilities; and (3) the ultimate commercial use of the cable system.

The coaxial cable system is a considerable departure from the conventional communication cable systems now in use, and the equipment used with the conventional cable systems is not adapted for the coaxial cable system. Therefore, there is a present need for the adaptation and standardization of the coaxial system so that if brought into extensive use the proper equipment therefor can be made available.

The application shows that the coaxial cable if installed as proposed will afford a frequency band of approximately 1,000,000 cycles. This band will permit 240 telephone circuits to be operated simultaneously, or 10 to 20 times as many telegraph circuits, or various combinations of both.

The testimony of the petitioners shows that the development and adoption of the coaxial system would tend to reduce rates as the system is brought into use, but there is no present need for the additional telephone channels between New York City and Philadelphia. However, the petitioners have made studies of prospective growth which indicate that there will be such a need by 1941.

One of petitioners' witnesses testified that 'the need for telephone facilities grows from time to time and that in the near future need for the coaxial cable will arise.' The Act contemplates both present and future public convenience. Moreover, there exists the need of reducing service rates.

The petitioners have stated that they do not propose to use the communication channels made possible by the coaxial system unless and until this commission authorizes such use except for the purpose of testing and standardizing the equipment when installed.

Section 214 of the Communications Act of 1934 applies to 'construction or operation.' Petitioners do not now seek authority to 'operate' this line in regular commercial use but only to make a 'trial installation' which using the terms of the Act, is a 'construction.'

Our certificate, accordingly, is limited to the terms of their application to make the trial installation of a new line and to perform the limited or incidental commercial uses thereof set forth in the application. The matter of permanent 'operation' in regular commercial use may hereafter be appropriately presented to us by petitioners and we shall consider that question when it arises.

We find that public convenience and necessity require the construction of the proposed coaxial cable and the limited or incidental commercial uses thereof set forth in the application.

The full band of 1,000,000 cycles will permit the transmission of television. This band is not, however, sufficiently wide to transmit television of as clear an image as is thought necessary for entertainment purposes. However, the cable is adequate to carry a much wider band and this can be done when repeaters are developed and installed which have such capacity.

In an inter-office communication of the American Telephone & Telegraph Co., made a part of the record herein, it is stated that in making the application to the commission the television feature was to be stressed. Upon consideration of the testimony of record and the extensive file of correspondence with reference to the installation of the coaxial cable whereby it would be available to the Radio Corp. of America for developing television, the commission finds that one of the objectives of the petitioners is to construct a cable suitable for the transmission of television.

The record shows that there is no present or immediate future need for the use of this coaxial cable for telegraph communication. However, under the terms of our order, the petitioners will be permitted a limited use of the cable in telegraph communication for experimental purposes only. The interveners, Western Union Telegraph Co. and Postal Telegraph-Cable Co., have stipulated that they have no objection to such use.

Certain parties engaged in the motion picture industry objected to the granting of the petition at this time on the ground that it does not relate to voice communication. However, we find that the development of the coaxial cable appears to be an advancement in the art of communications.

Counsel on behalf of the National Association of Broadcasters filed a brief urging that if the line is installed it be made available upon equal terms to all. A principal cause of concern is an apprehension that some advantage over others might be obtained by the petitioners with respect to the future use of the circuit for television.

The principal witness for the petitioners, Dr. Jewett, testified in substance that in the existing state of the art all schemes of television that have heretofore been proposed are variations of one fundamental principle which requires a broad band of frequencies. He testified that the proposed cable when installed will handle any kind of television yet known.

He also testified that the petitioners' part of the television problem will merely be the transmission of the television that others may want to send from their studios to broadcasting stations and that the petitioners are not interested in the transmitting apparatus of others beyond the matter of seeing that the thing delivered to the circuit of the petitioners to be transmitted is something that would not wreck the circuit or injure employes.

Obviously, for the safety of life and the protection of the plant, certain engi-

COMING CONVENTIONS

The Texas Telephone Association, Baker Hotel, Dallas, March 10, 11 and 12.

Oklahoma Telephone Association, Huckins Hotel, Oklahoma City, March 17 and 18.

Wisconsin Locally Owned Telephone Group, Park Hotel, Madison, March 24.

Wisconsin State Telephone Association, Park Hotel, Madison, March 24, 25 and 26.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 7, 8 and 9.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 22 and 23.

Indiana Telephone Association, Claypool Hotel, Indianapolis, April 29 and 30.

Kansas Telephone Association, Hotel Sunflower, Abilene, May 12 and 13.

New York State Telephone Association, Syracuse, May 20 and 21.

Missouri Telephone Association, Hotel Muehlebach, Kansas City, May 27 and 28.

neering limitations would have to obtain. But so far as the physical characteristics of the kind of frequencies used in television are concerned, there is no limitation in the proposed cable; and Dr. Jewett testified that so far as he knew there would be no restriction from the patent angle that would deprive the public of the use of the coaxial cable for television services.

He testified that while the people who want to experiment with television might be concerned with all sorts of patent aspects, that would have nothing to do with the coaxial cable and that during the period of experiment the cable is to be tried out for telephone, telegraph, and broadcast services and that to whatever extent it is advisable it might be tried out by anybody who has the right kind of equipment for using it for television.

The petitioners' witnesses have testified, and counsel have stated, that if this application is granted, they will, during the test and standardization period of the proposed coaxial cable system make said system available to other persons without discrimination for experimental transmission of television upon reasonable terms and conditions.

The application states that the estimated cost of the proposed construction will be $580,000; that $360,000 of this amount will be carried in the suspense accounts of the American Telephone & Telegraph Co., with the exception of $5,000 which will be paid by the New York Telephone Co.; and that the $220,000 remainder of the estimated total cost will be charged to development expense.

However, the commission has hereinafter provided in the terms and conditions of the certificate that all accounting items in connection with this proposed construction shall be carried through the respective suspense accounts to facilitate review by the commission.

If the application is granted, the petitioners state that they expect to start the construction immediately and that thereafter they will require at least one year to standardize the coaxial cable system before it is ready for regular commercial use.

Upon the facts presented, we find that the present and future public convenience and necessity require the construction by the petitioners of the coaxial cable and terminal facilities, repeaters and appurtenances between New York City and Philadelphia for the incidental commercial and experimental uses set forth in the application; and the certificate will accordingly be issued subject to the terms and conditions, which we find to be necessary in the public interest."

The commission specifies that reports be made in detail every 60 days concerning the physical progress of construction, and the costs as to equipment, labor, research and other principal elements are to be entered in each of several specified accounts.

"The petitioners," continues the order, "shall not make any unjust or unreasonable discrimination, or undue or unreasonable preference, between different persons, equipped with suitable facilities for the transmission and reception of television, who shall make application for the use of the coaxial cable system for experimental use in the transmission of television.

"The petitioners shall not, during the standardization period of the coaxial system, make or give any undue or unreasonable preference to any television system so as to exclude any other available practical television system."

A report shall be made every 60 days during the test and standardization period giving the names of "persons requesting the facilities for television or facsimile purposes and the persons to whom the facilities have been made available for such uses; the time, place, any elapsed number of days and hours of such uses; and the terms and conditions under which the facilities were made available."

"The petitioners," the commission specifies, "shall not operate the proposed coaxial cable system in general commercial usage for any service (other than the incidental commercial usage necessary for test and standarization purposes) unless and until, upon application under section 214 regularly made, this commission grants an appropriate authorization."

During the test and standardization period of the system the A. T. & T. is to submit quarterly until otherwise ordered by the commission, "a summary of the performance of the cable from an engineering and operation standpoint as compared with results obtained on regular facilities between New York and Philadelphia."

"We have found the FCC order acceptable," said Dr. Jewett. "Our acceptance has been filed with the commission. We estimate the time necessary to complete the job as about six months, but this will depend on the difficulties encountered. If things go well, our first physical tests of the conductor will begin when laying of the cable is completed.

"We are primarily interested in the cable only because of its telephonic or telegraphic possibilities, and extensive experiments must be carried out along this line before it is ready for tests by others. It may be late next fall before the circuit can be made ready for actual tests by television interests."

Use of coaxial cable transmission lines between cities is expected to prove a boon to the growth of the television industry in this country, and make possible the creation of picture networks to link many image broadcasters with a central television studio.

NATIONAL ASSOCIATION COMMITTEE STUDYING TELETYPEWRITER PRACTICES

THE United States Independent Telephone Association's general committee on Bell System special services procedure held its first meeting at the Hotel LaSalle, Chicago, February 28. This committee was appointed on January 2 to study the practices of the Bell companies in connection with teletypewriter, timed-wire services, etc., with special attention to the compensation being paid Independent companies for their part in the handling of such special services.

In order that the committee should be representative of all parts of the country, and its members be closely in touch with the various Bell subsidiary companies, it was decided to appoint a member from each of the Bell subsidiary operating territories, as well as a group of members "at large." The committee is as follows:

Louis Pitcher of Dixon, Ill., chairman; J. H. Agee of Lincoln, Neb., representing Northwestern Bell territory; Samuel Tucker of Pleasanton, Kans., representing Southwestern Bell territory; Wm. C. Henry of Bellevue, Ohio, representing Ohio Bell territory; W. N. McAnge of Bristol, Tenn., representing Southern Bell territory; E. R. Hannibal of Everett, Wash., representing Pacific Telephone & Telegraph territory in Washington and Oregon; A. Wardman of Whittier, Calif., representing Pacific Telephone & Telegraph territory in California.

O. M. Vaughan of South Haven, Mich., representing Michigan Bell territory; R. V. Achatz of Aurora, Ind., representing Indiana Bell territory; W. F. Goodrich of LaCrosse, Wis., represented Wisconsin Bell territory; J. P. Boylan of Rochester, N. Y., representing New York and New England Bell territory; H. E. Bradley of Harrisburg, Pa., representing Pennsylvania Bell territory; B. L. Fisher of Martinsville, Va., representing Chesapeake & Potomac territory; and R. A. Lumpkin of Mattoon, Ill., representing Illinois Bell territory.

(*Please turn to page* 38)

WHEN YOU PLAN A BUSINESS TRIP, REMEMBER

Telephone APPOINTMENTS *prevent* DISAPPOINTMENTS

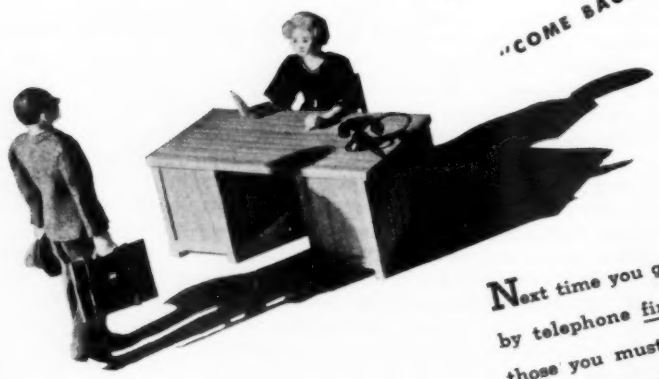
"GONE FOR THE DAY"

"TOO BUSY"

"OUT OF TOWN"

"IN CONFERENCE"

"COME BACK TOMORROW"



Next time you go out of town on business, by telephone first. Make appointments for those you must see. You'll save yourself lobby-waits and useless visits. You'll save money. And you'll save the other folks' time too. . . . Try it one week and see.

FEATURING

AN IMPORTANT BUSINESS USE OF LONG DISTANCE

● Making out-of-town appointments is a time-saving use of Long Distance. It is particularly valuable in selling, but it applies almost equally to all kinds of business contacts, and to organizations large or small.

● The advertisement on the opposite page, appearing in national magazines during March and April, pictures the predicament of a gentleman who has forgotten to telephone first. This brief, terse reminder should help to stimulate business toll traffic in all territories.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

Activities of Commissions and Courts

U. S. Court Upholds State Ruling on Depreciation

In a unanimous decision delivered by Justice Stone, the United States Supreme Court, on March 2, ruled that an order of the Nebraska State Railway Commission directing a telephone company to use, for the purposes of accounting and reporting to the commission for the year 1934, a composite depreciation rate of 3½ per cent upon all of its depreciable property in Nebraska is not invalid on the ground that "the Interstate Commerce Commission, pursuant to Congressional legislation, has occupied the field of regulation of telephone company accounting, and has made valid orders conflicting with that of the state commission," where the ICC had prescribed no depreciation rate when the state commission acted.

This opinion was rendered upon the appeal taken by the Northwestern Bell Telephone Co. from an order of the Nebraska Supreme Court.

The company contended a depreciation rate of 4.8 per cent was necessary and that the commission was without jurisdiction in the matter, since Congress had invested in the Interstate Commerce Commission (and subsequently, in the Federal Communications Commission) full and complete power to prescribe the accounting methods of telephone companies engaged in interstate commerce.

"Pending action by the Communications Commission establishing depreciation rates for telephone companies, state control over such rates remains unimpaired. We are not called upon now to consider the effect of state power upon such rates when adopted, or in view of the state of the record, to consider other objections to the order of the state commission fixing for the appellant a composite depreciation rate of 3½ per cent," said the United States Supreme Court.

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New York Accounting System Before Court

The New York Public Service Commission on March 5 commenced to argue before the New York Court of Appeals in Albany, with the National Association of Railroad and Public Utility Commissioners appearing as amicus curiae, its appeal from the denial by the Appellate Division of the Supreme Court of its right to enforce a revised system of accounts on leading public utility companies in the state (TELEPHONY of July 20, 1935).

In the main, the contest is over the right of the commission to demand that utilities segregate their capital accounts to show "original cost" of properties, to set up "straight-line" depreciation, and to charge against surplus the price paid for properties over and above the "original cost" to the first builder.

Virtually the same principles were tested by a special statutory Federal court sitting in New York City on February 18. It ruled against the Bell System, pointing out, however, that if any demonstrable injury resulted from enforcement of the new uniform accounting system by the Federal Communications Commission recourse to the courts might be had (TELEPHONY of February 29).

In the statutory court the National Association of Railroad and Public Utility Commissioners appeared as a party defendant, on the ground that it represented commissions having jurisdiction over telephone accounts in 46 states; the New York Public Service Commission, not a member of the association, appeared as amicus curiae.

The issues involved are considered serious by all public utility corporations. While methods and operations of the Bell System, it is stated, will not be affected vitally by introduction of the new accounting system, it is contended that some gas and electric operating companies may be affected to the point where their bonds may cease to be legal investments. Furthermore, it is held some holding companies will be entirely destroyed through an inability to obtain dividends from operating subsidiaries.

For 12 years public utility commissions in most states have had in use for greater or lesser periods a uniform system of accounts which, it is alleged by their critics, was influenced by the public utility industries.

With the New York commission in the vanguard, certain regulatory bodies contended that this accounting system was of no value in determining rate bases, which therefore had to be determined in long and costly investigations, through hearings and appraisals.

Efforts to get the National Association of Railroad and Public Utility Commissioners to adopt a more advanced accounting system were not successful. At one stage of the proceedings the New York Public Service Commission withdrew from the national body and drew up the rules that gave rise to this week's proceedings in New York state's highest court.

If the ruling by the Federal statutory court in the FCC accounting order case is appealed, which some observers believe unlikely until injury can be alleged, the American Telephone & Telegraph Co. will apply for a stay which, if granted, will permit application to the United States Supreme Court for a writ of certiorari.

Conversely, whichever side — New York Public Service Commission or the utilities—loses in the New York Court of Appeals, the case may go to the United States Supreme Court for final determination of any constitutional issue that may be raised.

While the New York and Wisconsin commissions, with possibly a few others, have ordered new accounting systems along the same lines, the FCC is the first of the national bodies to do so. The Federal Power Commission, on the one hand, and the National Association of Railroad and Public Utility Commissioners on the other, now are engaged in drafting similar accounting systems, identical in some respects and approximately parallel in others, which have as their bases the principles of "original cost" and "straight-line" depreciation.

Virtually every utility operating company in cities of 50,000 inhabitants or more resulted from gradual acquisitions of predecessor properties a generation or two ago. There are few known instances, except in a period soon after the World War, where such transactions did not represent a price to the purchaser considerably higher than the "original costs" of the builders of the component parts.

In utility circles the several actions to establish new accounting methods are described as "a concerted move to eliminate holding companies," and the issue is viewed as far surpassing in importance the legality of government power operation, Federal financing of municipal competition, or of Title I of the act regulating holding companies.

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Louisville, Ky., Rate Cut Enjoined by Court

The Southern Bell Telephone & Telegraph Co. was granted an injunction on February 27, by Circuit Judge Garnett, of Louisville, Ky., prohibiting enforcement of the 25-per cent rate reduction ordered by the Louisville city council. The order held that the city had been divested of its rate-making powers by

the creation of the Kentucky Public Service Commission.

Judge Garnett, however, ruled that difference in charges between those current and those proposed must continue to be impounded pending final determination of the case by the court of appeals.

Judge Garnett held that the 1934 act of the legislature gave the commission the all-inclusive power to originate, change and enforce rates of public utility companies.

The power of the commission to regulate rates, Judge Garnett held, was emphasized by the action of the 1936 legislature specifically exempting municipally-owned public utilities from provisions of the 1934 law. If it were necessary for these exemptions to be made, he said, it necessarily follows that the rates of all other utilities can be controlled by the commission. The city, he held, can present its request for a reduction to this new governmental agency.

Judge Garnett held that section 201 of the state constitution, as amended to permit the Home and Cumberland telephone systems to consolidate, required the city council to give its consent and that this power was used in fixing rates in 1924 for two years and again in 1928 for five years, after which they could be changed at the instance of either party.

He emphasized the fact that the city, as a precedent to giving consent to the consolidation, could have fixed a perpetual maximum rate but that it did not do so and it cannot do so now since the legislature stripped the city of its rate-making power before the aldermen attempted to reduce rates 25 per cent.

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Postal Employs Engineers and Accountants

The Lehman committee for holders of 5 per cent bonds of the Postal Telegraph & Cable Corp. on February 28 sent a letter to those holders saying that since the appointment of Alfred E. Smith and General George S. Gibbs as trustees of the corporation by the Southern New York District Federal Court had been made permanent, the trustees had petitioned the court for approval of the appointment of Sanderson & Porter, as engineers, and Peat, Marwick & Mitchell, as accountants, to assist them in the management of the property.

"This committee," the letter read in part, "is in favor of these appointments and has so advised the court. It is expected that the court soon will approve these appointments. The extent of the work to be performed by these engineers and accountants, and the cost, will be at all times under the strict control of the court."

The letter states that the Commercial Cable Co. did not pay the interest due on January 1, 1936, on the $20,000,000 of 4 per cent notes of that company which constitute part of the collateral held by the Guaranty Trust Co. of New York to secure the bonds and debenture stock of Postal Telegraph & Cable Corp.

Reporting that the company's current business is showing some improvement and maintaining its share of the total telegraph and cable business of this country, the letter advises that more than 4,000 holders of $23,500,000 of bonds have authorized the committee to represent them.

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Prall Reappointed Chairman of FCC

Press dispatches from Washington, D. C., state that mutual friends on March 2 disclosed that President Roosevelt has reappointed Anning G. Prall as chairman of the Federal Communications Commission for a term extending to March 11, 1937.

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Bell Companies File Teletypewriter Tariffs

In accordance with an order of the Telegraph Division of the Federal Communications Commission—dated December 23, 1935, in the matter of "minimum guarantee and joint-user provisions in teletypewriter exchange service schedules"—the following associated telephone companies of the Bell System filed revised pages to their teletypewriter exchange tariffs on February 4:

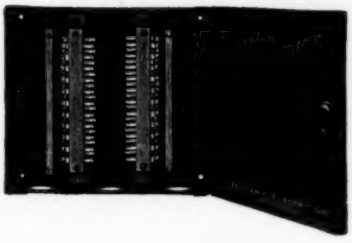
The Bell Telephone Co. of Pennsylvania; The Chesapeake & Potomac Telephone Co.; The Chesapeake & Potomac Telephone Co. of Baltimore City; The Chesapeake & Potomac Telephone Co. of Virginia; The Chesapeake & Potomac Telephone Co. of West Virginia; The Diamond State Telephone Co.; Illinois Bell Telephone Co.; Indiana Bell Telephone Co.; Michigan Bell Telephone Co.;

The Mountain States Telephone & Telegraph Co.; New England Telephone & Telegraph Co.; New Jersey Bell Telephone Co.; New York Telephone Co.; Northwestern Bell Telephone Co.; The Ohio Bell Telephone Co.; Southern Bell Telephone & Telegraph Co.; Southwestern Bell Telephone Co.; Wisconsin Telephone Co.; The Pacific Telephone & Telegraph Co.

A sample of the revised provisions is as follows:

"GUARANTEE: A central office line within the base rate area of a telephone exchange, together with a teletypewriter of either page or tape type connected thereto and a listing in teletypewriter exchange service directories of the name of the subscribing individual, partnership or corporation or a name under

Reliable



BUILDING BOXES

TYPE "E"

Type "E" Boxes are equipped with Reliable type "E" terminal strips and maple fanning strips. Manufactured for standard cables from 10 to 200 pair.

RELIABLE
Electric Company
CHICAGO

which a business is conducted, is furnished subject to a guarantee of revenue from intrastate and interstate connections of $10.00 per month.

"The rate for joint-user service, including one directory listing of the name of the joint-using individual partnership or corporation or a name under which a business is conducted, is $1.00 per month for each user."

In all cases the amount of monthly guarantee is $10.00. The rate for joint-user service is $1.00 per month for each joint user In the case of the Pacific Telephone & Telegraph Co., the $1.00 joint-user charge is a reduction from the $2.00 previously proposed to be put into effect on its system.

All of the tariffs are published to become effective April 1, 1936.

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Surrebuttal Filed in Utah Rate Case

The surrebuttal of the state of Utah, in the rate case against the Mountain States Telephone & Telegraph Co., was filed with the Utah Public Service Commission on February 14, by Frank L. Ostler, accountant for the state. Mr. Ostler charged that company witnesses had distorted his evidence by abstracting sentences from different parts of the testimony to make it appear that the evidence as a whole is contradictory.

An important factor in establishing a rate base is what the company calls structural value. This is arrived at by determining reproduction cost new of telephone plants and subtracting from it the observed depreciation.

Mr. Ostler contends that structural value as calculated by the company does not represent a value which is fair to the public "because of the improper measure of depreciation and the excess overheads in the replacement cost figures."

He quoted several prominent valuation engineers in support of his contentions.

He attacked the "inconsistency of collecting an amount for depreciation from the ratepayers which aggregates 2½ times the amount of depreciation found in the plant by company engineers in the physical inspection and appraisal," and attempted to show that "the same elements which produce depreciation for accounting purposes should produce depreciation for valuation purposes."

Mr. Ostler reasserted his previous contention that the Utah commission has the power to allow the company to use the sinking fund, rather than the straight-line method of depreciation. He had previously presented figures to show that the former method would save the ratepayers money and still allow the company a fair return on its investment.

Additional contentions made by Mr. Ostler in his surrebuttal are:

That entries recording the purchase of several Independent telephone companies are incorrect; that in the determination of structural value the company ignored two important factors, inadequacy and obsolescence; that the balance in the reserve for accrued depreciation fairly measures the depreciation in the plant because it represents payments by the telephone patrons to preserve the integrity of the investment; that $100,000 is a sufficient allowance in the rate base for working capital; that part of the cost of employes' pensions should be transferred from the ratepayers to the stockholders.

Answers to Traffic Questions on Page 18

1. See the introduction to these questions and answers.
2. If it is necessary to verify the station reached and an address name and number appear on the ticket, ask: "Is this John Brown's telephone?" If you receive a negative answer, ask also, "Is this 545 L?"
3. Say, for example, "Will you speak to the business office, please? I will connect you." Or connect the party with the person locally designated to handle such requests.
4. Give the usual "busy" report.
5. Attempt to secure the line at approximately two minutes from the time you first found the line busy and, if necessary, make additional attempts at the end of approximately four, six, eight and ten minutes.

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Wisconsin Tax Case Develops A.T.&T. Relations

The investigation into the activities of the American Telephone & Telegraph Co. in relation to the license contract it holds with the Wisconsin Telephone Co., occupied the Wisconsin Tax Commission attorneys during the last two weeks of last month. The tax commission is endeavoring to recover $1,000,000 in back income taxes from the Wisconsin company for 1929-30.

James W. Green, auditor of the general department of the A. T. & T. Co, was the principal witness before the tax commission. Mr. Green explained that the A. T. & T. operates in three classifications: long lines (long distance), license contract activities, and other, non-license activities.

He contended that 94 per cent of the activities of the A. T. & T. was in connection with the license contract it held with its subsidiaries and only 6 per cent in holding company activities. He admitted that while total cost of services rendered subsidiary companies under the license contract amounted to $20,000,000 a year in the interval, 1927 to 1930, the A. T. & T. received $150,000,000 a year from its subsidiaries as a result of its stock holdings in these companies.

The state contends that these developments show the license contract activities of A. T. & T., are by no means its greatest activity as claimed, but that its holding company ventures are much greater. The Wisconsin Telephone Co. claimed deductions of $1,400,000 from its income tax but the state disallows $1,300,000 claiming that services by the A T. & T. Co. were worth only the difference.

Attorneys for the tax commission on February 24, contended that the A. T. & T. Co. pocketed a $326,000 profit in selling its instruments to the Wisconsin subsidiary in 1927. For years before 1927, the A. T. & T. rented the telephone instruments to its subsidiaries, Mr. Green testified. In that year the A. T. & T. Co. sold the instruments to its associatel companies for $14,395,000 in excess of the net cost to it—an excess which attorneys for the state, John Best and Gordon Sinykin, contended was a profit.

Coincident with the sale of the instruments, the A. T. & T. cut its license contract fees from 4 to 2 per cent of the gross revenues of the subsidiaries. Mr. Green testified that of the 2 per cent reduction, 1½ to 1¾ per cent represented previous charge for rental and repair of instruments, constituting, commission attorneys contended, a rental collection of $13,000,000 in one year.

Brought down to Wisconsin, the testimony revealed, according to commission allegations, that in the one year the A. T. & T. made a rental profit of $103,000 on the Wisconsin company.

Under sharp questioning, Mr. Green insisted that he did not know why the parent company decided to sell the vast collection of instruments in 1927. Commission counsel, however, introduced statements purporting to show that cradle instruments were beginning to replace the old type in that year and that, in general, the old equipment had begun to break down.

Thus, the attorneys argued, if the A. T. & T. had continued to hold the

old instruments, it would have had to pocket the loss.

Another fixed charge levied by the American Telephone & Telegraph Co. against subsidiary companies was brought out at the hearing on February 25. Mr. Green admitted the parent company maintains a loan fund from which the subsidiaries borrow money at 6 per cent.

For maintenance of the fund, in addition to the 6 per cent interest charge, he said, the Wisconsin Telephone Co. is obliged to contribute an annual fixed charge based on its measure of assets to that of other subsidiaries. The amount of the payment is computed at the dividend rate of the company, Mr. Green testified.

Control of the American Telephone & Telegraph Co. by proxies held by a small "inner circle" of directors was assailed by attorneys for the tax commission on February 27.

Against the strong objection of Frederic Sammond, counsel for the Wisconsin Telephone Co., John Best, income tax attorney for the commission, introduced statistics bearing on the hold of the proxy committee over the half-million A. T. & T. stockholders.

Mr. Best showed that in 1927, one of the tax years in dispute, the A. T. & T. had 10,799,607 shares outstanding, of which 7,167,746 were voted at the annual meeting. Of these, 7,159,714 were voted by the proxy committee.

The figures showed the same trend in the other four years under scrutiny. In 1928, 7,170,419 shares were voted, of which 7,162,307 were the proxy committee of five. In 1929 the figures were 8,614,625 votes and 8,604,546 in proxies, and in 1930, 9,003,991 votes and 9,001,906 by proxy.

▼ ▼

New Rate Plan of New York Telephone Co.

The New York Public Service Commission, on February 19, accepted for filing by the New York Telephone Co. optional monthly rates under a new plan designated as extended scope service applicable to the Buffalo and Syracuse exchanges and contiguous territory.

The plan offers to measured service users of eight suburban exchanges surrounding Buffalo optional monthly rates under which the local calling area will include the city of Buffalo as well as the exchange in which the suburban subscriber is located. Buffalo subscribers to this extended scope service will receive service, on a local call basis, to the eight suburban exchanges in question, namely, Garden, Orchard Park, Grand Island, Williamsville, Lancaster, Hamburg, Wanakah and Tonawanda.

This service is available to Buffalo business subscribers upon payment of $1.25 per month more than their present rate; to individual line message rate subscribers at $1.00 additional and to two-party message rate residence subscribers at 50 cents additional. The suburban business subscribers may enjoy the extended scope service by the payment of 75 cents per month more than the corresponding Buffalo rate and residence subscribers by the payment of 50 cents more than the Buffalo residence rate.

The present station-to-station toll rate from Buffalo to Garden, Williamsville, Lancaster and Tonawanda is 10 cents and to Orchard Park, Grand Island, Hamburg and Wanakah it is 15 cents.

With respect to the territory surrounding Syracuse, business subscribers of that city may subscribe to extended scope service by means of which they may receive service with six suburban exchanges, on a local call basis, by the payment of $1 more than their present rates. Residence subscribers may do likewise by the payment of 75 cents additional. Any subscriber—business or residence—in the six suburban exchanges in question (East Syracuse, Liverpool, Baldwinsville, Camillus, Fayetteville and North Syracuse) may call Syracuse under the new plan by the payment of 50 cents per month more than the corresponding Syracuse rate.

The present station-to-station toll rate is five cents from East Syracuse or Liverpool to Syracuse, 10 cents from North Syracuse to Syracuse and 15 cents from Baldwinsville, Camillus and Fayetteville to Syracuse.

The establishment of this new service is the result of a proceeding instituted by the commission after a group of subscribers of the Garden exchange expressed a preference for the inclusion of Buffalo within their local calling area, for which they were willing to pay Buffalo rates. A survey showed that about 83 per cent of Garden exchange subscribers who expressed a preference for either service, were for Buffalo service at Buffalo rates, in spite of the fact that analysis of the Buffalo toll usage of Garden exchange subscribers showed that not more than 15 per cent of them would effect any saving in their telephone costs under the arrangement asked for and that at least 85 per cent would pay more under Buffalo rates.

In view of the survey and analysis made of the calls in the Garden exchange it was concluded, by the commission, that the inclusion of the Garden exchange within the Buffalo calling area at Buffalo rates would not be in

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"Telephony's" Engineering Data

By B. C. BURDEN

Index, Transmission Data.
March 7, 1936.
No. 15-A, Page 10.

Provided that the two wires in each physical circuit are identical in electrical characteristics, voice currents traveling via the phantom will divide equally at the center of the line winding of one side of one side circuit, each half flowing through the corresponding half of the winding to each line wire, over it to recombine at the middle point of the line winding of the repeating coil at the far end. There will be no current induced in the drop side of either repeating coil, due to the neutralizing effect of the two oppositely-flowing currents.

No interference with the side circuits by the phantom currents will result as the halves of these currents are flowing in the same direction over the two wires of the physical circuit and, therefore, set up no difference of potential at any two opposite points in the latter circuit. These phantom voice currents return in the same manner over the other physical circuit.

In addition to the straight phantom circuit described in the foregoing, there are other variations of this type of circuit, such as (a) the half or grounded phantom, (b) simplex

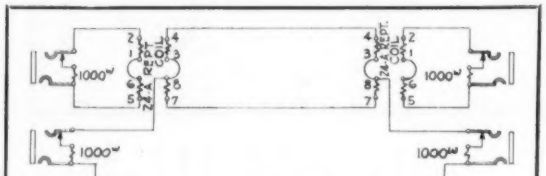

FIG. 6. HALF OR GROUNDED PHANTOM.

circuit, (c) half-phantom superimposed on a straight phantom group, (d) combination straight and half phantom, (e) split phantom, (f) straight phantom variation utilizing retardation coils.

The half or grounded phantom, Fig. 6, is derived from one metallic physical circuit with the other side of the phantom grounded. Such a method is not to be recommended, owing to the tendency of the grounded phantom to pick up earth induction and power noises; though it may be used as a temporary means of relief until the entire lines can be metallicized.

As an example of the use of the half phantom, this type

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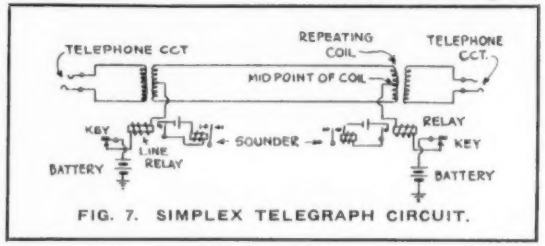

FIG. 7. SIMPLEX TELEGRAPH CIRCUIT.

of circuit can be utilized to reduce crosstalk on two long paralleling lines of the ground return type. By metallicizing one line and deriving the other from it, crosstalk can be eliminated. It does seem unfair to give the subscribers on one circuit metallicized line service and those on the other, grounded line service; but, regardless of this fact, both lines will give much better service than if operated on a grounded basis.

The simplex circuit is really a half-phantom circuit, being utilized to superimpose a telegraph circuit on an existing telephone line. Fig. 7 illustrates a simplex telegraph circuit which will not be further discussed, as detailed information on this and other telegraph circuits has already been given in the data sheets on "Telegraph Over Telephone Lines," General No. 34-A, TELEPHONY of January 5, 1935.

Fig. 8 shows diagrams of half-phantom circuits combined with or superimposed on a straight phantom group. These require no further description.

The split phantom, Fig. 9, is a useful device for dividing a phantom circuit into two separate sections to furnish a

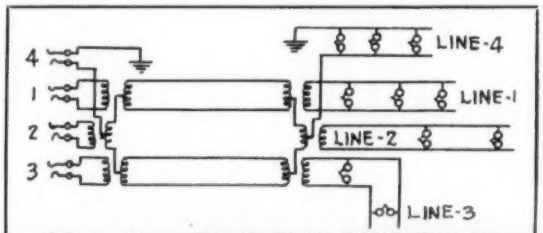

FIG. 8. HALF PHANTOM SUPERIMPOSED ON STRAIGHT PHANTOM GROUP.

"Telephony's" Engineering Data

By B. C. BURDEN

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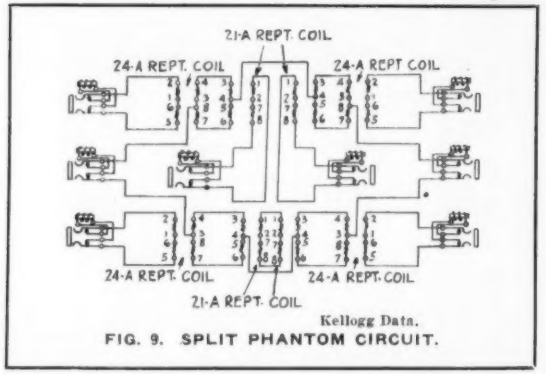

Kellogg Data.

FIG. 9. SPLIT PHANTOM CIRCUIT.

toll office intermediate between the two offices connected by a phantom group, with a connection to each. This is done without in any way disturbing the two physical circuits which continue on through, past the intermediate office.

A variation of this arrangement, which is much more extensively used, is illustrated in Fig. 10. A side circuit of the phantom group is split into two sections for connection to an intermediate point without upsetting the balance of the phantom and the other physical circuit, the latter two going on past the intermediate point to terminate at another office.

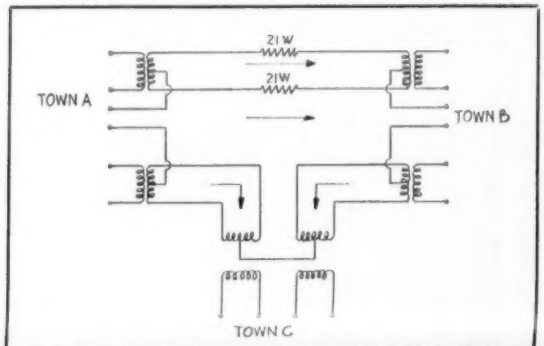

FIG. 10. A VARIATION OF THE SPLIT PHANTOM.

the interests of the majority of Garden subscribers, and that the extended scope service plan would better meet the needs of the majority.

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One-Man Company Case Taken to High Court

R. C. Simpkins, telephone company owner in Pontotoc County, Oklahoma, filed a petition with the Oklahoma Supreme Court on February 14, asking that he be granted a writ prohibiting the Oklahoma Corporation Commission from interfering with the operation of his toll line between Fittstown and Jesse.

The commission had denied Mr. Simpkins a permit and ordered him to pay a $50 fine when he operated the line in violation of its order.

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Bell of Nebraska Appeals Depreciation Case

The Northwestern Bell Telephone Co. has appealed to the Nebraska Supreme Court from the recent order of the Nebraska State Railway Commission that it set aside out of its earnings and credit to the depreciation account a sum of money representing 3.5 per cent of the book cost of depreciable property for the year 1936.

The company had vainly sought to get the commission to defer its final order until such time as the federal supreme court had acted upon the appeal recently submitted to it involving mainly the question of whether the state commission had not invaded the province of the national commission in fixing a rate.

▼ ▼

Contract Regarding Refunds for Service Interruption

The validity of the Rochester (N. Y.) Telephone Corp.'s contract with customers regarding refunds for interruption of service will be reviewed by the Court of Appeals in Albany.

The Appellate Division, Fourth Department, has granted permission to the telephone company to carry its appeal from dismissal of a technical point of its defense in a $25,000 suit to the highest state court.

Lewis E. Emery, of East Rochester, brought the suit on the ground that he could not get "Central" at 2 a. m., March 7, 1933. He alleges that his daughter, Kathleen, age 7, died that day because he was unable to communicate with a physician.

The telephone company maintained it was not liable because Mr. Emery failed to send written notice that his telephone service was interrupted, as provided in a contract approved by the New York Public Service Commission. This point of the defense was stricken from the case by the courts recently.

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Ohio Toll Agreement Scheduled for Hearing

On February 25 the Ohio Public Utilities Commission issued its third supplemental order dealing with toll traffic agreements between the Ohio Bell Telephone Co. and other telephone companies in the state. The latest order deals with such an agreement between the Ohio Bell and the Lorain Telephone Co., which contract was denounced by the latter company as of January 1, 1933.

The commission had previously approved such agreements between the Ohio Bell company and about 263 other telephone companies in Ohio. The order just issued assigned the agreement with the Lorain company for a hearing before the commission on March 11 at 10 a. m. for the purpose of considering and determining whether the agreement is in the public interest and thereby the public will be furnished service at a just and reasonable rate.

▼ ▼

Wants to Close Non-Paying Exchange

In filing his annual report for the Felker Telephone Co., of Mulberry, Ark., President M. H. Felker notified the Arkansas Department of Public Utilities that at the end of the year he would ask permission to discontinue service.

Mr. Felker stated that the "people are not working. Only need a place to sit. No telephones. Sam feeds them," (apparently referring to Uncle Sam).

Mr. Felker reported that he had 18 business telephones in operation, 38 subscribers on party lines and 300 idle telephones. "We don't owe anything," he stated. "We keep it up with our oil and undertaking business."

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Rules for Construction of Poles and Wires

Following a hearing at which all of the angles of the question were discussed, the Nebraska State Railway Commission has issued an order that the safety provisions, clearance rules and construction requirements set forth in the Bureau of Standards Handbook No. 10, safety rules for the installation and maintenance of electrical supply and communication lines, otherwise known as the National Safety Code, shall apply as rules of the commission governing the construction of pole and wire lines in the state when such rules, provisions and requirements are not in conflict with the laws of Nebraska or the regulations of the commission.

Back in 1919 the commission adopted rules relating to overhead lines at cross-

FIG. 10. A VARIATION OF THE SPLIT PHANTOM. TOWN C

FIG. 8. HALF PHANTOM SUPERIMPOSED ON STRAIGHT PHANTOM GROUP. LINE-3

porary means of relief until the entire lines can be metallicized. As an example of the use of the half phantom, this type

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ings and conflicts or involved in parallels in compliance with the existing state laws. In the main this followed the standards of construction recommended by the United States Bureau of Standards in its electric code No. 54.

Since then the National Safety Code has been revised a number of times to keep up with the accepted practices in the field of wire and pole line construction. The latest edition of this code having been generally accepted by state and national authorities, the Nebraska commission says that it should govern except where there is a conflict with its own rules or the state law.

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Commission Rulings and Schedule of Hearings

Federal Communications Commission Washington, D. C.

February, 26: On application the American Telephone & Telegraph Co., and New York Telephone Co. for permission to install experimental coaxial cable between New York and Philadelphia found (1) that the commission has jurisdiction over the construction, and (2) that the public convenience and necessity require such proposed construction. The commission issued a report containing finding and order on further hearing and reargument of petition.

February 27: In the matter of the petition of the American Telephone & Telegraph Co. and the New York Telephone Co. for permission to install experimental coaxial cable between New York, N. Y., and Philadelphia, Pa., an acceptance of the conditions imposed in the FCC's certificate of public convenience and necessity, issued February 26, was filed with the commission by C. P. Cooper, vice-president of the A. T. & T. Co., and H. C. Carpenter, vice-president of the New York Telephone Co.

March 2: Hearing before Chief Examiner Davis J. Arnold at Madison, Wis., on applications under section 212 of the Communications Act of 1934 for orders to authorize applicants to hold positions with more than one carrier subject to the act. Those whose applications were heard were: Edwin M. Blakeslee, Walter Dakin, Clarence D. D'Aoust, Emil E. Engsberg, Elizabeth M. Hiestand, John F. O'Connell, Harry W. Pike, Edward J. B. Schubring and Lewis F. Shepherd, all of Madison; and R. M. Matteson, Black River Falls, Wis.

March 5: Hearing before Chief Examiner Davis J. Arnold at St. Louis, Mo., on applications under section 212 of the Communications Act of 1934 for orders to authorize applicants to hold positions with more than one carrier subject to the act. Those whose applications were to be heard are: Harry D. McBride, Robert B. Deason, Albert B. Elias, Fred M. Hoag, Albert C. Hoffmeister, and Albert C. Stannard, all of St. Louis.

April 3: Hearing before Telephone Division en banc on the complaint of the Pensacola Broadcasting Co. against the American Telephone & Telegraph Co., of New York City, alleging overcharges over circuits from Mobile, Ala., via Flomaton to Pensacola, Fla.

Illinois Commerce Commission

March 2: Hearing in Chicago on citation of the commission on its own motion against the Illinois Bell Telephone Co., to show cause why there should not be a reduction in rates for intrastate telephone service rendered by the company in the state. Entry of appearance of city of Chicago, villages of Maywood, Olympia Fields and Richton Park. Protest filed by city of Cairo. (Consolidated with following case.)

March 2: Hearing in Chicago on proposed change in rates for telephone service of the Illinois Bell Telephone Co. stated in ICC No. 1 section 1 original sheet No. 5 general local exchange tariff, telephone service ICC No. 2 original sheet No. 1A, schedule of toll rates ICC No. 2 original sheet No. 1A, rates for special contract service and ICC No. 2 section 1 original sheet No. 6 teletypewriter exchange service tariff. Protest filed by city of Cairo. (Consolidated with foregoing case.)

Minnesota Railroad and Warehouse Commission

February 26: Authority granted the Chisago County Mutual Telephone Co. to acquire from the St. Croix Valley Telephone Co. a toll circuit extending from its exchange at St. Croix Falls, Wis., to Center City, Minn., and connected at the latter town to an exchange owned and operated by the Chisago County company. The circuit was jointly owned by the two companies.

March 13: Hearing in St. Paul on complaint of the Washington County Rural Telephone Co. against the Hastings Telephone Co., alleging invasion of territorial rights.

Missouri Public Service Commission

February 26: Complaint dismissed of Grover C. Wright, et al., against the Central Missouri Telephone Co. concerning rates.

Nebraska State Railway Commission

February 22: In the matter of the order of the commission fixing a rate of 3.82 per cent upon the depreciable property of the Northwestern Bell Telephone Co. to be set up on the books of the company, notice of appeal filed, bond fixed at $100, and transcript certified.

February 22: Application filed by the Lincoln Telephone & Telegraph Co. for authority to discontinue four-party service, no longer demanded, at its exchanges at Bellwood, Dewees, Weeping Water, McCool and Swanton; found reasonable and granted as asked, without hearing.

Ohio Public Utilities Commission

February 27: Alleging that the number of subscribers (less than 20) makes it uneconomical to further maintain a separate exchange at Carpenter, and that the service is now being rendered to these patrons through the neighboring exchange at Dyesville, the Meigs United Telephone Co., petitioned the commission for authority to abandon the exchange at Carpenter.

The applicant having asked that an order enter without a formal hearing, the commission directed the applicant to serve a copy of the petition on each subscriber in the Carpenter exchange, with notice that a period of 15-days would be accorded within which to object.

February 28: Authority given the Ohio United Telephone Corp. to publish a new schedule for services in the Eaton exchange reducing charges for extension telephones.

The new schedule makes the following reductions: Business telephones, located in the same building reduced from $1.25 to $1.00 net per month; business telephones, located in adjoining building $1.75 to $1.50; residence telephone, in same building reduced from 75 cents to 50 cents, residence telephone in adjoining building from $1.25 to $1.00 net per month.

March 11: Hearing on toll traffic agreement between the Ohio Bell Telephone Co. and the Lorain Telephone Co., of Lorain, for the purpose of determining whether the agreement is in the public interest and whether the service is furnished at a reasonable rate.

Buyer's Weekly Guide

A list of firms and companies offering equipment, supplies or services for operating telephone companies

ADDING MACHINES

Burroughs Adding Machine Company, Second Blvd., Detroit, Mich. — Adding, Bookkeeping, Calculating, Billing and Accounting Machines, Electric Carriage Typewriters, Standard Typewriters, Operator Correct-Posture Chairs. Burroughs machines are in use today in hundreds of progressive telephone companies throughout the country.

BATTERIES—DRY CELLS

Burgess Battery Co., Freeport, Ill.—Burgess Flashlights and Uni-Cel Flashlight Batteries—for dependability and service. The Burgess Twin-Six Telephone Battery—a 3-volt unit designed to replace two No. 6 cells, with longer life, lighter weight, smaller size and a leakproof case. The Burgess Little-Six—replaces the old type No. 6 cell, is smaller and lighter, will not ooze or bulge, has all the electrical capacity of the standard No. 6 cell.

National Carbon Company, 30 E. 42nd St., New York.—"Columbia" Telephone Dry Batteries; "Eveready" Flashlights, Flashlight Batteries and Long Life Dry Cells, "National Pyramid" brushes, carbon, graphite and metal graphite for motors, generators and rotary converters. "Eveready" Prestone anti-freeze; "Eveready" Rustone rust preventive; and "Eveready" Air Cell telephone operators' transmitter batteries.

BATTERIES—STORAGE

The Electric Storage Battery Company, Allegheny Ave. and 19th St., Philadelphia, Pa.—Exide Storage Batteries. Branches: Boston, New York, Rochester, Philadelphia, Pittsburgh, Washington, Atlanta, Cincinnati, Cleveland, Detroit, Chicago, Kansas City, Minneapolis, St. Louis, Denver, San Francisco and Seattle.

Philco (Battery Division) Tioga and C Streets, Philadelphia, Pa.—Philco Flote in Steel-Glass Storage Batteries for P. B. X. and central office operation. Your old batteries will command a liberal allowance toward any Flote in Steel-Glass Cell from 10 A.H. to 1056 A.H. Write now for catalog ...it will tell you the complete story of Flote in Steel-Glass—the finest of telephone batteries.

BATTERY CHARGING EQUIPMENT

General Electric Company, Bridgeport, Conn.—Tungar battery chargers. G-E pole line hardware. Cable filling compound.

North Electric Mfg. Co., Galion, Ohio. — Self-regulating battery chargers.

CABLE—LEAD ENCASED

American Electrical Works, Phillipsdale, R. I.—Paper telephone cable, switchboard cable, bare copper wire. Chicago Office: 20 N. Wacker Drive; Cincinnati: Traction Bldg.; New York: 100 E. 42nd St.

British Insulated Cables, Ltd., Surrey House, Embankment, W. C. 2, Factory: Prescot, Lancashire, England.—Telephone cable of all sizes and capacities.

General Cable Corporation, 420 Lexington Ave., New York, N. Y.—Paper telephone cables of standardized manufacture for over forty years. Weatherproof and insulated copperweld drop wire.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Can.—For any type of wire or cable used in telephone, telegraph or power work get in touch with "Phillips." Manufacturers of bare and insulated copper wires, rubber insulated wires, enameled wire, magnet wire, telephone cables, power cables, switchboard cables, flexible cords, copper rods, etc.

CABLE RINGS

National Telephone Supply Company, 5100 Superior Ave., Cleveland, Ohio.—National Cable Rings, National Splicing Sleeves, Non-Breakable Messenger Cable Hangers, Marlin and Swisher Cable Hangers and Custom Galvanizers. National cable rings are practical because they are two-way,—they allow the cable to be pulled in either direction. National sleeves make secure the weakest points in the line. If it's a splice—make it a National.

CABLE TERMINALS

Cook Electric Company, 2700 Southport Ave., Chicago, Ill.—Protective Pole Cable Terminals, Unprotected Pole Cable Terminals, central office protection, lighting arresters, sleeves, fuses.

Reliable Electric Company, 3145 Carroll Ave., Chicago, Ill.—Complete line of cable terminals, telephone and switchboard protectors, sleeves, fuses, solderless wire connectors and specialties.

CARBON DIAPHRAGMS

Noris Carbon Company, Inc., 160 5th Ave., New York, N. Y.—Carbon diaphragms, carbon back plates, granular and globular carbons, lightning arresters.

CORDS, CABLE AND WIRE

Lenz Electric Manufacturing Co., 1751 N. Western Ave., Chicago—Established 1904—telephone and switchboard cords for all makes of equipment, braided and lead-covered telephone cable, flame-proof jumper wire, interior telephone wire, switchboard wire.

CORDS AND WIRE

Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago—Telephone and Switchboard Cords, Flame-proof Jumper Wire, Switchboard Wire, Interior Telephone Wire. W. L. Runzel, President, has devoted over 40 years to the making of fine telephone cords.

ELAPSED TIME RECORDERS

Calculagraph Company, 50 Church St., New York, N. Y.—Calculagraph is the world's standard elapsed time recorder and gives you toll records printed with elapsed time to the second. Both spring driven and electric motor models are available.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

International Creosoting and Construction Company, Galveston, Texas—Creosoted Southern Yellow Pine Poles. Plants: Beaumont and Texarkana, Texas.

Jordan Bros. Lumber Co., Box 84, Nor-folk, Va.—Virginia White Cedar Poles. Plain or charred and creo-treated butts.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

Michigan Pole & Tie Company, Newberry and Grand Rapids, Mich. — "Poles with Character." Northern White and Western Red Cedar. Strategically located yards, Minneapolis, Minn., and Reed City (Lower Michigan), insure quick deliveries.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada — Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles Plain or Butt treated.

SUPPLIES, SWITCHBOARDS AND INSTRUMENTS

American Automatic Electric Sales Company, 1033 West Van Buren Street, Chicago, Ill.—Public Automatic Telephone Systems, Private Automatic Telephone Systems, Central Battery and Magneto Manual Telephone Switchboards, Remote Control Switchboards, Telephone Instruments of all types, Battery Eliminators, Charging Equipment, Signaling and Control Apparatus, Cords, Wires, Cables, Monotype Copperweld Drop Wire, and a complete line of construction materials and supplies.

Automatic Electric Company, 1033 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Telephones, relays, signaling and control equipment.

Automatic Electric Company, Ltd., Milton Road, Edge Lane, Liverpool, England. —Automatic Telephone Equipment.

Automatic Electric Sales Company, Ltd., 1027 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Manual Telephone Equipment, telephones, storage batteries, wire, cable, poles, etc.

Kellogg Switchboard & Supply Company, Adams & Aberdeen Sts., Chicago, Ill.—Engineers and designers, manufacturers and suppliers of complete equipment for telephone exchanges and communication systems. Manufacturers of "Master-built" Common Battery, Magneto and PBX Switchboards, "Masterphone" Telephone Instruments, and a complete line of telephone supplies, including bronze drop and interior wire.

North Electric Manufacturing Company, Galion, Ohio—Machine switching telephone systems. Automanual and Automatic. "All-Relay" Switching Apparatus (Dialless and Dial Control). Unattended Satellite Systems. Dials (automatic).

Siemens Brothers & Company, Ltd., Woolwich, England—Automatic and Manual Telephone Equipment.

Stromberg-Carlson Telephone Manufacturing Company, 100 Carlson Road, Roches-ter, N. Y. — Telephone apparatus of all kinds, switchboard cords, cable and general telephone supplies.

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Crescent Tool Co., Jamestown, N. Y.—CRESTOLOY Pliers, Curved Needle Nose Pliers, Heavy Diagonal Cutting Pliers, Linemen's Side Cutting Pliers, End Cutting Nippers, Crescent Hack Saws.

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STUDYING TELETYPEWRITER PRACTICES

(*Continued from page* 27)

Members at Large: J. E. Albert, Standard Public Service Co., Columbus, Ohio; J. G. Crane, Telephone Bond & Share Co., Kansas City, Mo.; J. B. Haley, the Western Telephone Corp., Kansas City, Kans.; Gustav Hirsch, Columbus, Ohio; Lon Jester, Mid-West States Utilities Co., Chicago; and E. G. Waters, American Utilities Service Corp., Chicago.

The association had sent to all of its member companies a questionnaire asking for their experience in teletype and other special services. The answers to these questionnaires had been carefully tabulated and were submitted to the committee. In addition, a special analysis had been made of the filing practices in the Illinois Bell territory, as illustrative of the Bell practices generally.

This analysis showed the rates filed for various classes of special services and the compensation being paid to the Independent companies, as well as the location of all teletypewriter installations.

After a discussion in detail of the various problems presented, the committee voted that a question should be submitted to the membership at large which would embody the committee's opinion on the basis for compensation to the Independent companies for handling these special services. It was also agreed that the committee would hold its next meeting in June. In the meantime the members of the committee are to contact the association members in their territories to discuss the question submitted and the principles involved.

Some time was devoted at the meeting to the question of the proper procedure to be followed in connection with making tariff filings with the FCC. It was thought that the present procedure being followed by the Bell companies may be bringing before the FCC local rates of "connecting carriers" who are not required to file rates with that commission.

It was recommended that further discussions of this procedure should be had by the association's officers with American Telephone & Telegraph Co. officials, in an effort to arrange a different procedure in connection with certain classes of filings; all looking to close cooperation with the Bell companies in meeting the legal requirements of the Communications Act and with the Federal Communications Commission in meeting all necessary requirements of the commission's tariff regulations.